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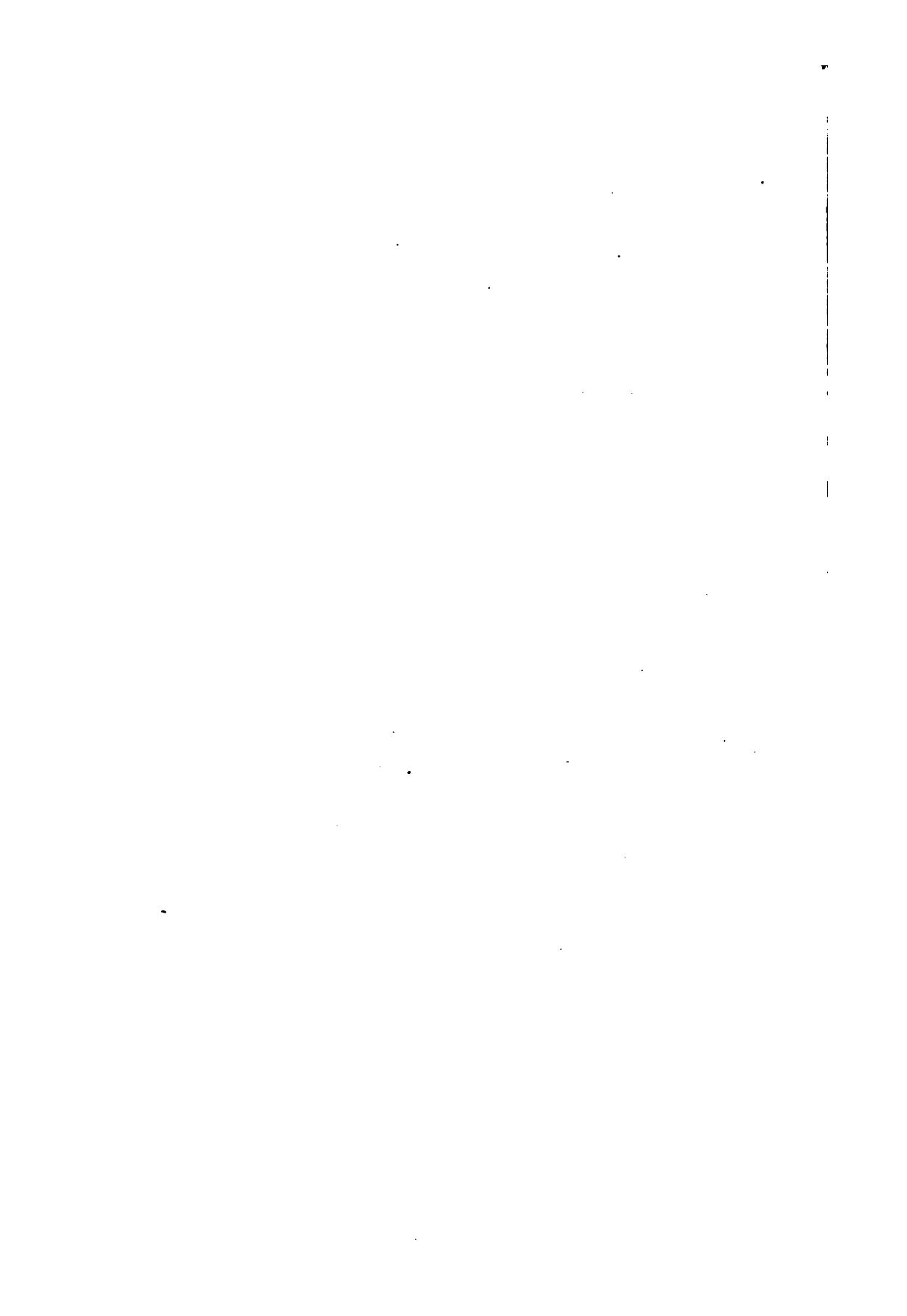
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EDITED BY

E. C. SEGUIN, M.D.

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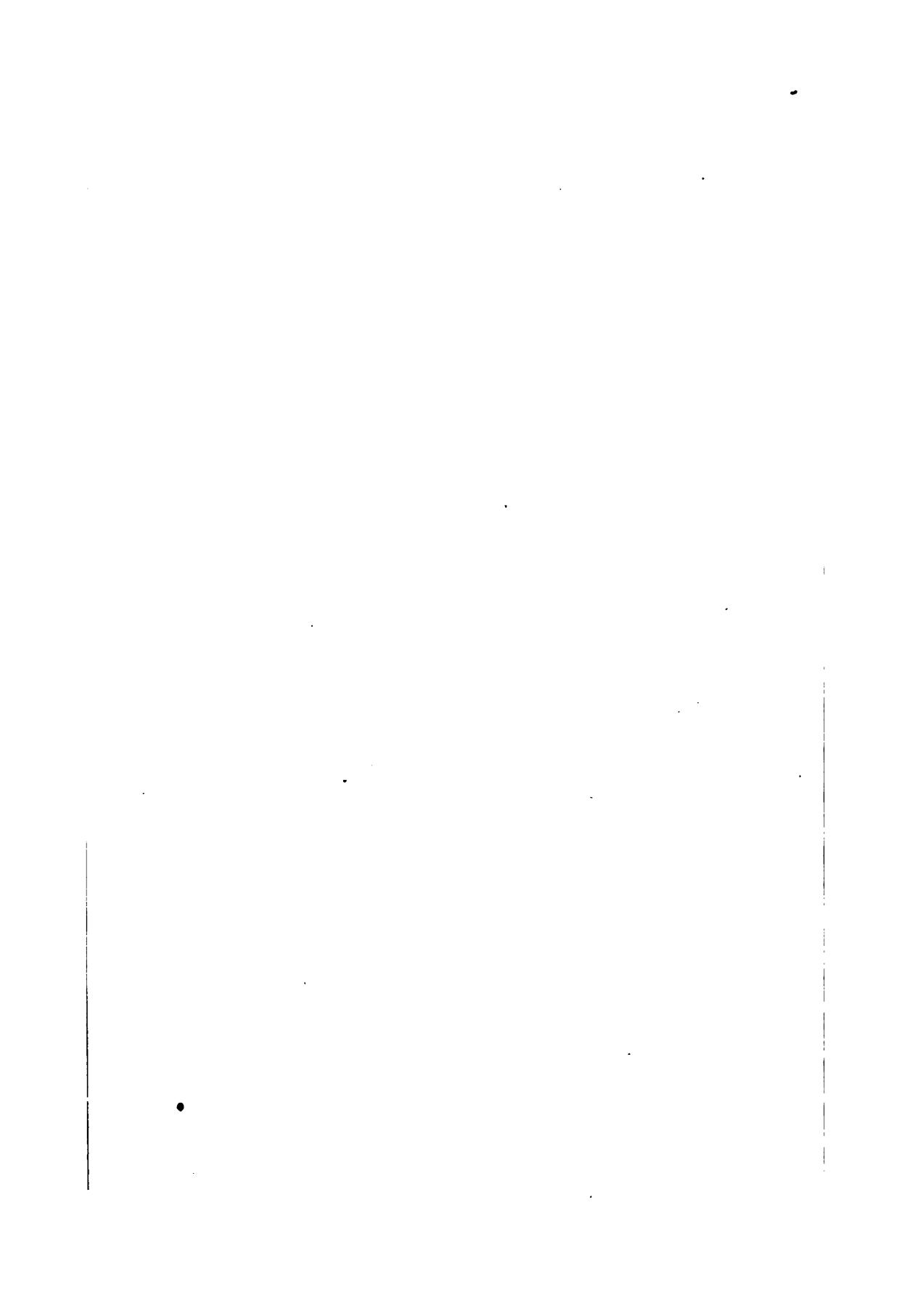
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**Vol. III., No. 1.**

**January, 1877.**

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**TRANSFUSION OF BLOOD,  
AND ITS PRACTICAL APPLICATION.\***

BY

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**GENTLEMEN:**—That there is nothing new under the sun is a maxim the truth of which is confirmed by researches into almost any branch of our profession, and the first suggestions of that which to-day I am going to point out to you as a new and valuable operative procedure may almost, without exaggeration, be said to be as old as the hills.

**History.**—Transfusion of blood is mentioned in the Metamorphoses of Ovid ; to the sorceress Medea being attributed the power of renewing youth by injecting youthful blood into the veins of the aged, and there seems to be some ground to believe that the operation was at all events proposed among the Egyptians, Greeks, and Romans ; while, if we are to believe a Jewish manuscript quoted by Dr. Oré, of Paris, it was actually practised in the case of one of the princes of Assyria. If then we accept this as the first recorded case, the second would be that of Pope Innocent the 8th, who was afflicted with an habitual torpor, from which his Jewish physician tried to arouse him by successively injecting into his veins the blood of three young men, all of whom died, together with the aged subject of the experiment. It is only

\* Lecture delivered at the Pennsylvania Hospital, January 27th, 1877.

fair to add, however, that a member of the Jesuit order has publicly denied that this operation ever took place.

Libavius, in 1615, notices transfusion as a remedy in the case of persons exhausted by disease, and describes transfusion from artery to artery by means of silver tubes.

Several other writers of the ancient and middle ages also mention the operation, and one even gives a picture showing how to operate. The very fact, however, that Hippocrates does not speak of transfusion shows, that with the ancients it was more of a dream than a reality, and discourages the idea of its performance in an age when medicine was so generally dominated by the genius of this greatest of physicians. Indeed it is manifest that, until the discovery of the circulation of the blood, such a remedy would have poor excuse for its exhibition. But in the seventeenth century we find that the battle which every new operation has to fight against the rightful conservatism of science, as well as the prejudices of ignorance, was fairly opened.

Stimulated, it is said, by the suggestions of Sir Christopher Wren, Dr. Richard Lower, in 1665, first transfused blood from the veins of one animal to those of another, with a success that warranted further experiments; and in 1666, Jean Denis, of Paris, possibly with knowledge of the attempts of Lower, successfully transfused, with lamb's blood, a young man who for a fever had been bled, purged and blistered, times innumerable, and was very naturally pulseless and delirious. Denis performed the operation on several occasions after this, and in one case says he restored to reason a mad man, in whom forty bleedings had failed to effect a cure, by two successive transfusions with the blood of a calf. During two months the patient remained well, and then fell into a fever, for which transfusion would again have been performed; but when, upon opening the patient's veins, no blood was found the operation was abandoned, and the sick man died the same night, presumably of poison given him by his wife.

There now, according to Monsieur Denis, was hatched a conspiracy against transfusion, and the dead man's wife was bribed to declare that he died from the effects of this operation ; but, the case being taken to the courts, the medical men went unpunished, though a decree was made that transfusion should never be performed without the consent of the Paris faculty, a consent apparently hard to obtain, for the operation now fell into disuse and so long remained.

Meanwhile, fired by the reports from Paris, Drs. Lower and King, on November 23d, 1667, transfused Arthur Coga, at Arundel House, London, for no apparent reason except curiosity. The method of operation, as gleaned from several detached accounts, was as follows : In a young sheep the carotid artery was laid bare, and its upper end tied ; into the side toward the heart a quill was thrust, and the artery was tied tightly on to it. The sheep was now bled twelve ounces, which amount it lost in the space of one minute, and this was intended to be some guide as to the amount that would pass into the man. A vein in the receiver's arm was now carefully opened, and he was allowed to lose six or seven ounces of blood, after which a silver tube was inserted, and the quill in the sheep was connected with the silver tube by means of other quills, so as to form a pipe through which the blood ran for "two minutes at least, so that a pulse could be felt in the vein." The operators calculated that nine or ten ounces were transfused, and the man was so pleased with the effect that he wanted the operation repeated, but was prudently put off.

Yet, in spite of this success, transfusion was abandoned ; but not entirely forgotten.

In 1785, Dr. Harwood, of Cambridge, wrote a thesis on the subject, and performed many successful experiments upon animals. In 1795, or thereabouts, Dr. Physic, of Philadelphia, transfused in a case of post-partum hemorrhage, and this was undoubtedly the first time the operation was performed in America, the next case I

am able to find being that of Dr. George McClellan, also of Philadelphia, who is reported to have transfused in cholera, about the year 1832.

But the restoration to favor of this operation is undoubtedly due to Dr. James Blundell, of London, who, in 1825, published his "Researches Physiological and Pathological." Dr. Blundell performed a large number of interesting experiments upon dogs, which proved conclusively the value of transfusion in the case of threatened death from hemorrhage. In one case he revived a dog that to all appearance had been dead five minutes, owing to the opening of one of the carotid arteries; but he found that the suspension of the functions of life for a longer period than this was uniformly fatal, in spite of the free use of the hot bath and artificial respiration. On another occasion he supported a dog for three weeks solely by the injection of blood, it sometimes being thrown in by the syringe, and sometimes passed directly from artery to vein; and during this whole time the dog showed no inclination to eat, though he took water, and at the end of the period did not seem dangerously disordered, in spite of considerable loss of flesh, and some constitutional disturbance.

In these cases the blood of another dog was used, but, where human blood was substituted, the results were far different, for the animals did not rally as formerly, and in every instance finally died, thus proving what may now be considered as well ascertained, that the blood of one species of animal cannot be injected into another species, in any large amount, without risk to life, though the experiments of Brown-Séquard, and the constant use of lamb's blood in Germany in cases of phthisis, not to speak of the early operations before recounted, show conclusively that the injection of a small amount can be easily recovered from. Indeed, I think it can be laid down as a fact that blood taken from the veins of one animal and injected into an animal of another species *is a poison*, the severity of the results, as with all poisons, depending entirely

on the amount injected. Blundell also injected air into the femoral vein of one dog to the amount of five drams, and into another to the amount of three drams, without serious consequences, though the dogs were more or less unfavorably affected by it. He generally used a syringe or else a somewhat complicated apparatus of his own invention, called an "impellor," though he occasionally resorted to the immediate method, and his operations on the human subject were at first singularly unsuccessful, but this is rather to be attributed to the circumstances of the cases than to any defect in the method of operating. Of his first five cases—all of which were unsuccessful—in two out of three, undertaken for hemorrhage, the patients had actually expired ; and in the other the supply of blood failed ; while he once attempted the operation unsuccessfully for collapse from vomiting, in cancer of the stomach, and again in collapse after bleeding for puerperal fever. But in spite of these unfortunate, because desperate, attempts, his success in the case of hemorrhage in animals, and the logical conclusions drawn therefrom, excited general interest in the medical profession, and it was at once seen that, without the human constitution differed very much from that of the other warm-blooded animals, transfusion could frequently be employed with the best results. Very naturally, desperate cases of post-partum hemorrhage were those in which it was at first employed, and the earliest successful case belonging to this new era that I can discover was that where Dr. Blundell successfully transfused a woman for post-partum hemorrhage. Four ounces were injected by means of a syringe, and the woman recovered without a bad symptom. This was in August, 1825, and was almost immediately followed by a successful transfusion at the hands of Mr. Edward Doubleday, of London, the cause for the operation being precisely the same. These operations were followed by many others where the patients presented the same indications. The Germans, with their usual zeal, adopted it, and tested its effects in diseases of various kinds,

and although the tide of professional favor has more than once retreated, and again advanced, transfusion has gradually increased in favor, until it has become one of the recognized operations which the surgeon may be called upon to perform. Dr. Oré, of Paris, Dr. Gesellius, of St. Petersburg, and Professor Landois, of Greifswald, have given us valuable works on the subject ; while, in America, Dr. Howe and others have frequently performed the operation in New York. Dr. J. G. Allen has had several cases in Philadelphia, and Drs. Proegler, Wild, and Hotz have introduced it to the West.

*Indications for the operation, etc. :*

We have now to ask, what are the indications for the operation of transfusion, in what diseases has it been suggested, and how is it to be performed? Unfortunately for the progress of the operation, it has been performed in so many diseases of a character which could in no wise be benefited by it that many have formed an unfavorable and I may say an unfair opinion as to its merits. Now by carefully restricting the operation to those cases in which experience has fully demonstrated that it may be resorted to with a fair expectancy of success, we shall have transfusion generally recognized as a thoroughly practical operation ; one which the surgeon cannot only honestly recommend, but which the patient has a right to have suggested, when other remedies have in vain been tried. An examination of the records of transfusion shows that the operation has been more frequently and successfully performed in cases where death has been imminent from simple loss of blood.

Thus, excluding some doubtful cases, I find that, in one hundred and three instances of transfusion for what might be called pure post-partum hemorrhage, over fifty-six per cent. recovered ; while, in forty-one cases of hemorrhage after wounds, operations, etc., over fifty-eight per cent. recovered under this treatment.

If, however, the cases of tranfusion for disease are examined, the

results are far different, and indeed it is only when, as a result of disease, accident, or operation, life is threatened from loss of blood that the operation can be said to be distinctly and constantly indicated, although, in cases of exhaustion incident to the various blood changes, an infusion of a new, vigorous element into an impoverished circulation is not unfrequently followed by the most gratifying results.

I shall now briefly refer, firstly, to those diseases in which transfusion may be properly recommended and performed. Secondly, to those in which the operation is of doubtful utility, and thirdly, to the cases where it may be said to be absolutely contra-indicated.

*Hemorrhage* of course claims our first attention. A person dying from loss of blood, writes Gross, "presents a fearful picture : his countenance is ghastly pale ; his pupils are widely dilated ; he pants and sighs for breath ; his ideas are vague and confused ; he is sick at the stomach and vomits ; the extremities are icy cold ; and the whole surface is covered with a profuse, clammy perspiration. The thirst is usually intense and unquenchable, the largest quantity of water failing to satisfy the urgent wants of the system. Excessive restlessness and jactitation succeed ; the patient calls loudly for cold air ; paroxysm after paroxysm of swooning recurs ; the pulse has, perhaps, been long absent from the wrist ; the eyes assume a glazed and fixed expression ; the respirations grow more and more feeble ; and death often steals in so imperceptibly as to render it difficult to determine the precise moment of its occurrence. During all this time, whether it embraces only a few minutes or hours, or whether it extends through several days, there is generally an entire absence of pain, the loss of blood operating as an anaesthetic." This condition is to be seen in severe flooding after or during delivery ; in traumatic hemorrhage, when large vessels are wounded, or when, in the performance of surgical operations, an extreme amount of blood is lost. Lately, at one of the English hospitals, during a hip-joint

amputation, death was averted and a life saved, at least for a time, by the operator giving his own blood, which was at once transfused into his patient ; and there is now before you a woman whom I believe I saved from death by the injection of blood during collapse following a severe operation for the removal of a tumor.

In hemorrhage associated with railroad injury we often have shock, not only as a result of loss of blood, but transmitted or direct shock, from injury of the nerves ; and although we may be able partly to replace by transfusion the loss of blood, the injury to the nerve centres may be irremediable, and thus many railroad injuries prove fatal ; but it is not always possible to form a correct estimate of the nerve lesions, where the loss of blood has been excessive, so that transfusion in such cases, as might be expected, often proves unavailing ; but, as a practical hospital surgeon, I say that one should not be discouraged. True, the records of the operation in traumatic hemorrhage from railroad injuries are bad, yet a life may perhaps now and then be saved, and it is our duty to do all for our patient that in such an emergency art or science can suggest.

My last operation for hemorrhage was in the case I have just shown you. The patient, a woman aged thirty-four, was admitted into the wards of this hospital on account of hemorrhage from a vaginal tumor. The amount of blood lost was, according to the testimony of the patient, "at least a gallon." The prostration was extreme ; all the signs pointed unquestionably to an immense drain of blood. After a short residence in the hospital the tumor was examined, and found to be of so vascular a nature that another hemorrhage was threatened. I accordingly determined to remove it ; but, although little blood was lost during the operation, it was not quite completed when a failure of the pulse was observed, and death on the table seemed at one time imminent. Stimulants however averted this, but at the end of twenty-four hours the condition of non-reaction continued, and death apparently was inevit-

able, for the stomach ~~rejected~~ all nourishment, and the general condition of the sick woman was very ~~similar~~ to the ideal case of exhaustion from hemorrhage I have before described.

With the counsel of my colleague, Dr. William Hunt, I performed transfusion, a daughter of the patient giving the blood. Three ounces were injected, and twenty-five minutes after a sharp rigor supervened. Brandy with milk and carbonate of ammonia were given ; but no relief came until morphia was injected hypodermically. This acted like magic, producing a quiet sleep, and a tardy but excellent recovery has resulted.

This case, both Dr. Hunt and myself believe, could not have lived without resort to transfusion. I might quote case after case, but prefer to give to you simply my own experience.

We find in hemorrhages generally—not only traumatic, post-partum, or from the intestinal tract, but in those peculiar dyscrasias or blood changes in which we recognize the hemorrhagic diathesis, or a predisposition to purpura hemorrhagica—the operation of transfusion has given the best results. There are many instances, of course, of alarming hemorrhage which are controlled by the well-recognized hemostatics, and it is a matter of surprise how soon after immense loss of blood some patients react, and appear to make up what has been lost ; but occasionally a sudden outpouring of blood shocks the nerve centres so profoundly that reaction will not occur, and death and the cessation of the hemorrhage are not unfrequently simultaneous ; while again there are cases where, after the hemorrhage has been controlled, the shock from the loss of blood is so great that stimulants lose their power, and reaction is uncertain. In these cases transfusion of blood promises to save life, and should always be resorted to. The same may be said of loss of blood occurring in the hemorrhagic diathesis, and of those cases of bleeding from the intestinal tract which occasionally present themselves in the course of typhoid and other fevers.

In 1869 a young man twenty-seven years of age was admitted into my wards for exhaustion from loss of blood. He was one of those curious examples of the hemorrhagic diathesis in which obstinate and uncontrollable bleeding almost surely follows even a scratch of the skin or a mucous membrane; eight days before admission, falling on some broken china, he had received a wound of the upper lip extending into the superior maxillary bone, and he had lost blood continuously ever since the accident. All local means tried to arrest the flow of blood failed, and every wound made by an acupressure pin bled so freely that it also required attention. Finally, when the patient was nearly exsanguine the carotid was tied; on the following day coma supervened and death seemed imminent. In this very unfavorable condition transfusion was performed, and in two weeks' time the patient walked into this amphitheatre, and was exhibited to the class. He afterwards died suddenly from rupture of the internal jugular vein; but the unfortunate death was in no way connected with the operation.

I have successfully transfused in three cases of purpura hemorrhagica with epistaxis. The first of these cases was a child eleven years of age, who had had three attacks of purpura with bleeding from the nose. She had never during these attacks been alarmingly ill, but early in 1874 she was suddenly seized with general hemorrhage from the nasal mucous membrane; simultaneously the skin from head to foot presented the usual characteristic spots, some of these of enormous size; when nearly exhausted, as a *dernier ressort*, transfusion was performed with a happy result. Some two months after a re-occurrence of hemorrhage with all the former symptoms obliged me to transfuse again, for an immense amount of blood had been lost before I saw the case. The very rapid recovery which took place after both these operations presented a marked contrast with the tardy convalescence following the previous attacks, which, although in the amount of blood lost, much less severe, had confined the patient to bed for many months. Three

years have elapsed since the last transfusion, and during this period she has had but one attack of nasal bleeding, which was easily controlled by plugging. The third case, in which I transfused for purpura and hemorrhage, was a more youthful subject, a boy barely seven years old, who had bled from the nose almost uninterruptedly during the previous two weeks. When I first saw him he had a number of blue spots over his body, one on his right buttock being nearly eight inches in diameter. The child was evidently sinking, and had just been brought to the city from the seaside, where he had been sent by his physician, Dr. Boisnot, on account of the hemorrhage. Every possible remedy had been tried in vain ; the hemorrhages still continued. I at once transfused him, and he made a rapid recovery. A finer and more robust boy is now nowhere to be found. He has never had the least symptom which would indicate a recurrence of the difficulty, and seems perfectly well in every respect.

In hemorrhage in the course of typhoid fever I may refer to one case which occurred last summer in the practice of my friend Dr. Newlin Stokes, of Moorestown, N. J.; the patient, a child of nine years of age, in the eighth week of the disease and thought to be convalescing, was suddenly seized with hemorrhage from the mouth and kidneys; the skin also became covered with purpuric spots; the prostration was so alarming that immediate death was expected; an injection of two and a half ounces of defibrinated blood was made, and an excellent recovery was the result. Besides the woman before mentioned, I have lately had two cases of transfusion for hemorrhage, both of which terminated fatally.

One of these I saw in consultation in the lower part of this city. The patient, a youth of nineteen, while gunning received a frightful wound of the thigh just above the knee. The arteries, veins, nerves, and bones were shattered, and an immense amount of blood was lost. Although in a state of shock the lad's mind was clear ; he answered all questions intelligently, and begged to have

his life saved if possible. The operation, which was conducted with the assistance of my friend Dr. A. H. Halberstadt, of Pottsville, I think prolonged his life, but he died some ten hours after. The next case was a railroad crush of the right leg with intense shock, in a policeman forty-five years of age. He was received into the wards of this hospital in December, 1876, under the care of my colleague, Dr. Levis, with whom the operation was performed. After the transfusion, which was through the radial artery, the poor fellow seemed invigorated, opened his eyes and said, "I can see so much better." For a time the improvement seemed to continue, but the operation gave only temporary benefit. Of transfusion in post-partum hemorrhage I have no experience, but the recorded cases show most favorable results, and I think in concluding this part of the subject it may safely be said that the proper use of transfusion of blood will, as a rule, avert threatened death from hemorrhage, provided no intense nervous shock has additionally prostrated the patient.

In *idiopathic anaemia*, *chlorosis*, *leukæmia*, and *exhaustion*, transfusion has been often practised. In my own experience the operation has been unfavorable in pure anaemia, although the general result, in the above class of cases, has been in a measure the reverse. Unfortunately for the operation, it has been so long delayed, in some of these cases, that any chance of benefit has been destroyed. When this has been the case we find the nerve-centres have become so weakened, by the long-continued devitalized or poisoned blood, that they cannot respond to the stimulus of fresh blood, and there is but faint hope for success. I have had an opportunity, on three occasions, of observing the effects of transfusion in anaemia. The first was an instance of this form of malady which I saw in May, 1875, with Dr. William Pepper, who, in an elaborate paper, has fully described the case. The patient was fifty years of age, and was "in his usual health until the early part of February, 1875. About the 10th of that month he did an unusually hard day's work, and noticed the next morn-

ing that he was feeling weak ; in April his debility had become so extreme that he was compelled to remain in his chamber. On April 10th there was rather an abrupt appearance of oedema of face and extremities ; there had been no diarrhoea, no hemorrhage, or exhausting influence of any kind, to produce this steady increase in prostration. At the same time an alarming state of pallor of surface developed itself, the skin becoming excessively pale, with a faint sallow tinge ; was free from suffering, and took interest in everything, retaining his faculties perfectly." Dr. Pepper's record states that, on April 30th, "his facies was strictly corpse-like, deathly pale, with a trace of sallowness, but without a vestige of healthy color ; conjunctivæ pearly white ; lips blanched ; gums bloodless ; tongue dry, and very pale, coated on dorsum ; no coolness of surface. Lies with eyes closed, and dozes constantly.

. . . Respirations are regular, quiet, with healthy vesicular murmur ; pulse weak, quick, and compressible, 96 to 102 in the minute, somewhat irregular, with occasional intermissions ; heart's action similar, soft musical haemis murmur at base, heard along pulmonary artery, and less strongly over the aorta ; no emaciation, the degree of flesh being very little less than when in ordinary health ; no oedema of any part, no petechiae, or ecchymoses ; abdomen normal ; no ascites ; liver not enlarged nor sensitive ; spleen slightly enlarged." Transfusion was recommended and performed without delay, at 6.30 P. M., with the assistance of Dr. C. T. Hunter. The patient "experienced some sense of increased strength, but no change occurred in his appearance." May 2d : Patient "passed a good night, sleeping nearly two hours at a time ; he said he felt stronger. On the 4th and 5th the patient was not so well, so that the following day, at 12.40, transfusion of five and one-half ounces of defibrinated blood was again resorted to. During the injection of the first syringe-full pulse remained at 120, but grew intermittent, losing three or four beats in the minute. During the injection of the second syringe-full the pulse rose

during the first quarter of a minute to 33. The third syringe-full was injected very slowly, occupying quite one minute; during this the pulse was in the successive quarters 28, 27, 28, 28; and, during the injection of the fourth syringe-full, 29, 29, 27, 27. The operation was accomplished without pain or discomfort to the patient. As soon as it was over, he said that he was glad it had been done and that he felt a little stronger. Later in the day the patient's temperature rose; . . . color grew livid, and with great restlessness, and complaints of pain in the head; . . . at 9.30 he was unconscious; and at 3 A. M., May 7th, he quietly expired." A careful examination failed to demonstrate any other change than that found in "idiopathic anaemia."

The second case was lately in the wards of this hospital, under the charge of Professor Da Costa, with whom I saw the case, and was I think shown to the class on several occasions.

The patient was 26 years of age; was admitted December 14th, 1876. During the summer he had been unwell, and was treated in the hospital for a general debilitated condition, with loss of flesh, and such excessive weakness as to confine him to bed; having a transient attack of jaundice, with a yellow skin, frontal headache, and attacks of faintness. His bowels were regular and movements sometimes slate-colored, urine scanty and high-colored, and his feet showed a tendency to swell. In 1870 he had a chancre, but denied constitutional symptoms. Under treatment he improved; but the same general condition returning he was again admitted as above stated, when he was found to be rapidly losing flesh, with no appetite, severe headache, and a temperature of  $103^{\circ}$ . The urine was now amber-colored and acid, with a specific gravity of 1.012, and free from albumen, sugar, and bile. Splenic dulness was not increased, nor was there enlargement of glands; but he had tenderness on pressure in both loins, and the heart had a soft, systolic murmur. There was also a slight congestive dulness at the apex of the left lung.

On the 27th looseness of the bowels had developed, but the general condition was about the same.

On January 4th an examination of the blood showed extreme deficiency of red blood corpuscles, but no marked increase of the white. The patient's general condition seemed to have improved. A few days later the breath became fetid, the face assumed a greenish tinge, and a few spots on the chest and face showing slight bronzing had developed. The ophthalmoscope simply showed pallor of the disk.

From this time the patient gradually became weaker, with all the signs of pure anaemia, and was transfused by myself at the request of Dr. Da Costa on the 10th of January, 1877. Just previous to the operation the patient was delirious and evidently sinking, with great restlessness, and extremely feeble pulse. The left radial artery was laid bare, and three and one-half ounces of defibrinated blood were injected with no marked effect. An hour after the patient became still more restless, and died within an hour and a half after the operation.

At the autopsy, five and one-half hours after death, the blood was found more fluid than usual, indeed it was actually watery ; but neither gross nor microscopical examination of the bones, lungs, heart, liver, spleen, supra-renal capsules, nor kidneys showed anything to account for death, and it cannot be said that the cause of his disease was discovered. More than a week previous to the operation I urged an early transfusion ; but, although the patient was carefully watched, there was apparently no sudden declination of the forces until the day the operation was undertaken, when a very rapid failure demonstrated that a fatal issue might occur within a very short time.

My third case of transfusion for anaemia has lately occurred at the Jewish Hospital. The patient was admitted to its wards about one year ago on account of anaemia. "He was unable to walk much ; would get dizzy, and felt like falling." From this he

partly recovered, and was discharged in about five weeks, but was readmitted in December last, when he complained of the same symptoms, with great loss of appetite and intense weakness. From the day of admission he steadily failed, and two months after was transfused with about two and one-half ounces of defibrinated blood, which was injected into the radial artery. Two hours after the transfusion he died. This case presented most of the symptoms which so constantly are observed in anaemia of a fatal character, and was very similar to the cases previously noticed ; unfortunately no post-mortem examination was obtained.

Dr. Joseph W. Howe, of New York, has reported a successful transfusion in anaemia consequent upon necrosis. Such a case, however, is likely to be very much more favorable than in idiopathic or pernicious anaemia, where there are most undoubtedly grave lesions of the blood factors, which, although so far not recognized in either the post-mortem or microscopic examinations, certainly do exist, and, necessarily, the mere introduction of a small amount of new blood can only in a slight degree improve the unhealthy fluid, or renovate the starved and poisoned vital centres. The question yet remains, however, whether transfusion in the earlier stages of this difficulty may not arrest the progressive blood degradation, and furnish a basis for alterative and curative action. Indeed, the histories of the cases I have been able to collect seem to favor this view.

*Pulmonary Consumption.* It would be difficult to say what remedies have not been tried to arrest or avert pulmonary consumption. It is no wonder then that much has been said in favor of and expected from transfusion of blood. Dr. Oscar Hasse, of Germany, has published over thirty cases of transfusion with lamb's blood in phthisis, with a reported temporary improvement in almost all of them. These favorable statements led to others trying his experiment ; but the results, I regret to say, are simply the reverse of those reported by Dr. Hasse. In our own country Drs. Prægler,

Wild, and Hotz, of Illinois, made in the summer of 1874 some very valuable experiments in this direction, and in a most interesting paper on this subject Dr. Hotz says of Dr. Hasse's report of his earlier cases : " So enthusiastic a statement apparently based upon facts could not fail to make an impression on the medical fraternity, and induce others to try the operation. *A priori*, it is true we could not understand how the transfused blood was to act upon the pulmonary disease. It did not seem very likely that the simple addition to the blood of a few ounces of fresh lamb's blood would materially influence so complicated a disease as phthisis." These gentlemen were, however, induced to make a trial of the operation in pulmonary consumption, and they transfused with lamb's blood in five cases. Dr. Hotz says : " Our experiments do not corroborate Dr. Hasse's observations, although some of our patients offered the most favorable conditions for a good result. All patients experienced an improvement of their feelings and appetite for the first four to six weeks following the transfusion, but the benefit was only temporary."

Dr. Joseph W. Howe has also transfused a number of times in advanced lung disease, but the results were not encouraging ; goat's and cow's milk and human blood were severally used. Where the goat's milk was injected the patient died two days after, but Dr. Howe believes that the operation neither shortened nor lengthened the life of the patient. I have also received from Dr. G. F. Cooper, of Valparaiso, Chili, notes of three cases of transfusion with lamb's blood in phthisis by Dr. Dessauer ; the results were unfavorable. From all accounts the operation of transfusion in phthisis in any stage of this disease cannot be recommended, save perhaps in some favorable cases for a temporary purpose.

In *cholera*, although statistics show that the operation has been unfavorable, yet there are a sufficient number of instances where, in the collapse of this disease, the operation has directly saved

life. Dr. Edward M. Hodder, of Toronto, has reported three cases of *Asiatic cholera* in which he injected cow's milk; two of these cases recovered and one died. The patients are described as being almost *in articulo mortis*.

As early as 1832 it is said that the late Dr. George McClellan performed transfusion in one case of *Asiatic cholera* in this city, which, however, proved fatal. I am not aware that it has ever been done here for this disease since that time. In such a fatal malady as cholera it would seem that transfusion would be fairly indicated, and future experience may exhibit better results; at any rate, I should not hesitate to advocate the operation should death seem inevitable.

In *uræmic intoxication* one case in which the operation was performed terminated favorably. In *phosphorus poisoning* a successful case is also reported; while in poisoning from *carbonic oxide* the results are not altogether unfavorable.

*Carcinoma.* When, beyond a doubt, the case is one of cancer, should the question be asked, "Is it possible for transfusion to be of the least benefit?" unhesitatingly I should reply "No," and should condemn such interference, although the operation has been done for this form of disease. There are cases, however, of internal carcinoma which are so masked, and resemble in so many points pure anæmia, that the patient might fairly have the benefit of the doubt. Such a case occurred in my practice in 1870. The patient was a gentleman, aged forty-five, who presented at first symptoms of gastric derangement, with occasional vomitings, and slight loss of flesh, etc. Examinations made by Drs. John F. Meigs and S. Weir Mitchell failed to effect a satisfactory diagnosis. The bloodless appearance of the patient, the absence of any abdominal tumor, with very slight tendency to swelling of the hands and feet, gave rise to the idea that the affection might be pure anæmia. The skin and the mucous membrane of the gums and lips were absolutely blanched, and he had very much the appearance described

in Dr. Pepper's case. Although the patient was able to retain a very large amount of food, no part of it seemed to be assimilated, and death from exhaustion really seemed inevitable. On November the 12th death was imminent ; and although the presence of concealed cancer was discussed and thought possible, yet we were unable to discover any local manifestation of its presence. With the assistance of Drs. Mitchell, Wm. Hunt, and Brinton, transfusion was performed, and six ounces of defibrinated blood were injected into the median basilic vein without an untoward symptom ; the gums and lips at once received some color, which gradually deepened, a comfortable night was passed, strength and spirits revived, and the patient was able to get out of doors. Two months after a general failure was observed, with constant sick stomach and rapid emaciation, and death took place on the 23d of March, nearly five months after the operation. The post-mortem examination revealed a soft, superficial carcinomatous ulceration of the cardiac portion of the stomach. The other organs were healthy. Here transfusion gave a temporary new lease of life. Such cases involving necessarily so much obscurity in their diagnosis are rare, and for a time after the operation hopes were entertained that the affection was one of simple anæmia. It is only in such questionable cases of cancer that transfusion may legitimately be undertaken.

The records of the operation in *pyæmia, septicæmia, and puerperal fever* it is almost useless to give. As might have been expected they show a disastrous result. It needs no argument to prove why, in such a naturally fatal disease as pyæmia, transfusion should not be of the least benefit. Yet some cases are reported as having been saved ; but it is much more likely that these were cases which would have recovered without the operation, internal abscesses probably not being present. At all events the statistics show the operation is practically useless, and ought not to be repeated.

In *tetanus and epilepsy* and other affections of the nervous system

transfusion has many times been resorted to, with results, in most instances, similar to the cases of pyæmia.

In the fatal exhaustion incident to some of the eruptive fevers transfusion has been practised a number of times. In *variolous diseases* the results have been altogether unfavorable, while in *scarlet fever and diphtheria*, although often performed, the results have been uniformly discouraging.

In *scurvy*, however, the operation has been quite successfully employed, Dr. Roussel, of St. Petersburg, having reported three cases, and Mader one case, with excellent recoveries in all. In the *asphyxia* of new-born infants all efforts with transfusion have failed, with perhaps one exception, that reported by De Bellina, who in 1870 injected an ounce of defibrinated placental blood into the umbilical vein of an infant; one year afterward the child continued in excellent health.

It has been my intention to make some experiments with transfusion of blood upon animals subjected to the poison of snakes, with special reference to the rattlesnake poison, but as yet I have not had the opportunity of carrying out my plans. I should however be disposed, in a case of probable fatal poisoning of this kind, to very freely deplete the circulation, and then inject a large amount of fresh, healthy blood. Transfusion has been tried in vain to avert a fatal issue in *hydrophobia*. I need only allude to this operation in the case of *insanity*; for the authorities on this subject condemn in the strongest terms the experiments which have been made from time to time. Pure blood is undoubtedly an important factor in restoring a diseased brain; but it would seem that it can best be gained through the various means now universally employed by scientific alienists all the world over. In this country, I am not aware that the attempt to cure insanity by transfusion has ever been seriously considered, though I believe it has been tried in Italy a number of times without benefit, by Manzini and Rodolfi, thus reviving the practice of Denis, previously spoken

of; but I cannot find that the success of the modern operators equals that reported by the older one.

For the last two years it has been my intention to try transfusion in cases of *sunstroke*, and Professor James A. Meigs offered me the opportunity of testing its effects in apparently hopeless cases coming to his wards in the Pennsylvania Hospital. But owing to my absence from the city, and other causes, the experiment was never made. Nevertheless I shall try its effects when a favorable case offers ; for certainly in such a sudden and fatal disease attended with disorganization of the blood it would be fair to attempt to revive the only recently poisoned nervous centres by this means. In such a case I should be inclined to bleed largely, thereby relieving the congestion of the head, and to a certain extent freeing the system from poisoned blood, and then attempt to make up the deficiency and reinvigorate the system by a copious injection of a purer fluid.

*Operation.* We now come to the operation itself, and here we find that difference of opinion which might fairly be expected. Undoubtedly that which we desire is this : either to supply a venous and arterial system drained of blood with the vital fluid, or to replace a diseased and vitiated fluid with that more healthy, stimulating the depressed nervous system, and furnishing a foundation for the creation of a more healthy supply. Blood, then, fresh, pure, alive, if I may use the expression, is what we desire, and the older operators attempted to furnish it ; but in time doubts were expressed. The injection of blood clots, they said, is fatal, but in normal blood can we guard against this danger ? The injection of blood to be safe should be instantaneous, it should flow from donor to donee almost as quickly as if in its natural channels ; but such instantaneous transfusion, at least where venous blood is used, can hardly be accomplished, while in any case the contact with a foreign body would still threaten the formation of clot ; therefore we will remove the fibrine from which the clot is formed. This, as you already

know, can easily be done by whipping the extracted blood, and practically the best way is to beat the blood with small whisks of broom straw. Take an ordinary clothes whisk, cut off the handle, tie the straws up into little bundles, and whip the blood with bundle after bundle, removing each as fibrine is deposited. In about three minutes most of the fibrine can be removed, and the blood will after this remain fluid even for weeks. But is it natural blood? Alas! no. However, if we avoid a great danger by doing a small injury, this is undoubtedly the best method and the one now generally adopted. So we have two methods, the defibrinated and the non-defibrinated, often distinguished as the mediate and the immediate; for though of course the mediate method might be used with non-defibrinized blood, practically in such transfusions the blood is conveyed directly from vein to vein by means of a tube with as little delay as possible; while of necessity defibrinized blood cannot be conveyed directly from vein to vein and must be transfused, not immediately, but by the mediation of a syringe or other propelling force.

*Is blood so treated and deprived of its fibrin rendered unfit for use?* To settle this question satisfactorily in my own mind, I submitted to Dr. J. Gibbons Hunt, the eminent microscopist, some defibrinated blood and the whisks with the attached fibrin. Dr. Hunt says: "I have examined the blood you sent me, and with some care. The fibrin among the broom whisks really contains a slightly relatively larger amount of white blood-cells than in the blood which is defibrinated, and this we might expect from the character of the white cell, it being more adhesive than the red cell. Moreover we know that blood during coagulation, probably by contracting, expels most of the white cells toward the outer parts of the clot, so that we might readily be deceived in an observation such as this. No change *in form* of either white or red corpuscle is apparent in either the defibrinated or in the fibrin blood. In defibrinating blood for transfusion, there *is not* any appreciable loss of red corpuscles, neither is there any

actual disturbance of the normal relative proportion of white and red, viz., about one white to three hundred and thirty red. In no way whatever is there any evidence that the blood after defibrination suffers any degradation in its nutritive or in its therapeutic properties."

Again comes the question of what kind of blood? The older operators used the blood of animals, the modern ones use human. And although as you know the older practice has been lately revived, there can hardly be said to be an excuse for its performance; for, in addition to what has been previously stated, it is only necessary to say that the injection of lamb's blood, both in Germany and this country, has been almost always followed by a rigor, fever, general depression, erythema, and a long train of symptoms, which are certainly not to be desired. Once more there is the question, is it better to inject arterial or venous human blood? I say arterial is probably the better, but get it if you can. Fifty men will have a vein opened where not one would consent to the cutting of an artery. Practically then the question is narrowed to this, shall we use pure blood or blood deprived of its fibrine? On the one hand the old or non-defibrinized method was long used with excellent results, and successful cases have even been reported where a syringe was used and its tube actually became plugged by clot; but defibrinated blood has also been repeatedly tried with success, and as there is always danger of a small clot being found in the natural blood, and a capillary plugging may bring on fatal disorders, the question is, shall we expose the patient to this *supposed* danger, and is there any peculiar value attached to non-defibrinized blood to make up for the risk thought to be incurred? I answer no, to the extent that I have always used defibrinated blood, although I am by no means convinced that the use of pure blood, even when slightly clotted, is attended with danger, and the following experiments lately tried upon dogs seem to warrant my doubt:

I. In a medium-sized mongrel bitch that had been etherized, I opened the femoral vein in the left leg, and drew out about two ounces of blood into a warmed receiver; when this had been exposed about twelve minutes, and clot had formed, it was beaten so as to break up the clot, and one ounce was injected into the femoral vein of the other leg. Both veins were now tied and the skin drawn together by sutures. During the following night some blood was lost, bleeding being finally controlled by pressure, and the next day the animal seemed rather stupid, but took food, and in three or four days seemed as well as ever, save for lameness produced by the wounds. She continued in this good condition for a week, when she was killed by means of chloroform. Dr. Morris Longstreth, pathologist to the Pennsylvania Hospital, has kindly furnished the following report of the post-mortem examination : " Nothing abnormal was found anywhere in the body except in the lungs. The lungs, however, when first removed presented a uniformly pinkish white color on the surface, and seemed crepitant throughout. There were no pleural adhesions. After the lungs had laid perhaps half an hour on the table, a thorough examination of them was made. The lateral and posterior portions of both lungs about equally presented whitish raised spots, varying in size from a large pea to a grain of wheat. Their color was not pure white, but merely whiter than surrounding lung ; they were not projecting or pedicellated portions, but merely made prominent by the partial collapse of surrounding lung. Some few of these whitish places now showed very small red, almost hemorrhagic centres on the pleural surface. There also now came prominently into sight much more numerous patches having a hemorrhagic appearance. Their size was in general about that of a grain of wheat. These hemorrhagic-looking points were not surrounded by any white area ; they had not increased resistance, as determined by pressure of the fingers. On section of the whole lung the appearances just described were found mostly limited to the surface of the organ, although a very

few whitish nodules were present below the surface, but yet lying more peripherally than centrally. The hemorrhagic points, if they existed, were concealed by the blood flowing over the surface of the section. The section of an individual white nodule showed its figure to be nearly spheroidal. In no instance did the figure appear wedge-shaped. The centre of the nodules presented no evidence of softening more marked than at their peripheries. They were by no means hard or fibrous in their consistence, although more resistant than the surrounding air-containing lung. The color was very light pinkish white. They yielded very little if any serum, and nothing could be scraped from the surface of the section by the scalpel. Their immediate surrounding showed no hyperæmic (reactive inflammation) zone."

"The larger vessels of the lung contained no clot. The cavities of the heart contained no fibrous clots. The vein of hind leg was apparently obliterated at the seat of operation; above this point the vessel as well as the ascending vena cava were normal. . . . No microscopic examination was carried out."

It is plain that exactly what was expected had here occurred. The clots thrown in had gone from the heart to the lungs, and been there as it were filtered out, and the question now arose whether these small pieces would excite abscess or be themselves absorbed.

II. To determine this another dog that had been injected with one ounce of blood, which blood had been exposed for over fifteen minutes, and was so full of clots that the canula was once or twice choked by them during the operation, was killed at the end of two weeks. Dr. Longstreth says : "Nothing abnormal was found except in the lungs. On removal of lungs their surface presented whitish spots having irregular figures, and varying in size very greatly, none larger than a two-cent piece. Those spots never became prominent above the surface as in the former case. There were seen no distinctly red areas. On section of the lung, which was crepitant throughout, it was found that the whitish areas were

limited to the surface of the lung, extending below the pleural surface very little more than a line or two in depth. As the knife cut through them it seemed to meet with slightly greater resistance, indicating increased firmness at these whitish spots. The immediately adjacent lung showed no hyperæmic zone, and the pleural surface was normal. The base of the right lower lobe of lung was distinctly more congested than that of the left side, and this appearance became more marked after perhaps half an hour than at time of removal ; otherwise the lung at this part was normal. The whitish spots were not more numerous, and on section the cut surface was not granular, nor was the consistence of the tissue lessened in this lung. No clots were found in the heart cavities." It is evident that the lungs here were regaining their normal condition, and in this case at least no bad results would have followed the injection of clot. To make the matter more certain, however, I made one more experiment.

III. I injected a small and active mongrel dog with one ounce of clotted human blood, which had been exposed for about two and one-half hours. There were some symptoms of constitutional disturbance ; but when at the end of three weeks the animal was killed he seemed perfectly well, and Dr. Longstreth reported that nothing abnormal was discovered in the lungs or in any other part of the body.

Now it would not do to say that in a human being, especially in one with a tendency to scrofula, such experiments would be safe ; but I have earned the right to declare that the injection of a small amount of clot is not nearly so dangerous as it is supposed to be, and it is to be remembered that under no circumstances would a patient receive as much clot as was injected into the veins of the subjects of these experiments.

Another bugbear, in spite of the experiments of Blundell, is the injection of air, which it has often been said would be instantly fatal. Some years since, at my suggestion, Dr. W. B. Hopkins

injected air in a number of dogs without unfavorable results, and I have lately performed the following experiments :

IV. I injected into the femoral vein of a good-sized dog four drams of air ; a distinct bubbling noise was heard as the air passed into the vein. The animal was considerably depressed, but mainly, I think, from the prolonged use of ether. He was carried into the open air, and water thrown over him freely, when he was soon able to get on his legs, although very weak. No unpleasant symptoms followed, and a day or two after he seemed in perfect health.

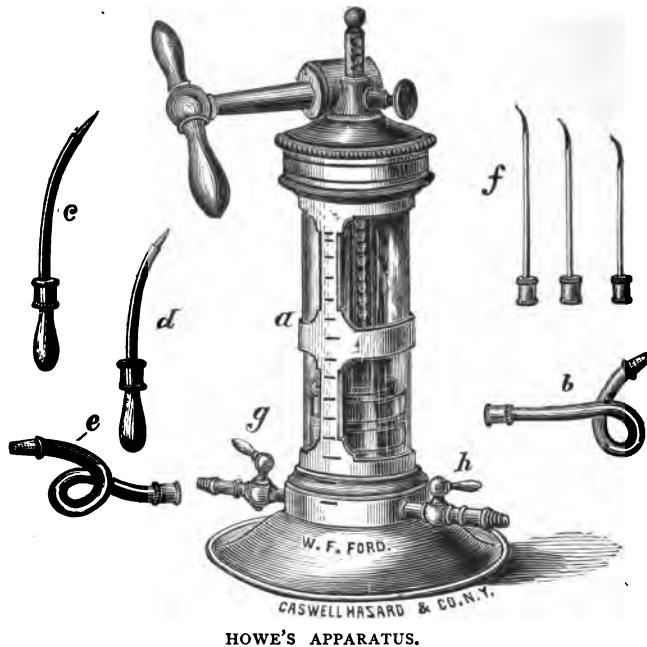
V. Two drams of air were injected into the femoral vein of another dog. He recovered more rapidly than the first one, and showed no bad effects.

*Methods of performing the operation :*

Dr. Howe, who has had much experience in this operation, and who has kindly furnished me reports of his cases, with an engraving of the apparatus used, has attempted to avoid the supposed danger of clot in some cases, in a way different from that I have pointed out. He does not remove the fibrine, but he treats the blood with a solution of ten grains of the carbonate of ammonia to an ounce of water, thereby preventing clotting, and Dr. Hicks, of London, ~~has~~ attempted to arrive at the same result by the use of a solution of phosphate of soda ; but I do not think that it is by any means clear that such operations do not vitally injure the blood, and the practical success of this method is certainly not greater than that following the use of the defibrinated fluid.

Dr. Howe uses Dieulafoy's aspirator. He first aspirates the blood from a vein. Passing into the glass cylinder it is mixed with the solution of carbonate of ammonia. Meanwhile a trocar and cannula have been inserted into the vein of the receiver ; this is attached by another tube to the cylinder, and, the action of exhaustion being reversed, the blood is thrown into the patient at any desired rate of speed. Dr. Howe describes his method as follows :

"A roller bandage, two or three inches wide, is placed around the arm above the bend of the elbow, and tightened sufficiently to obstruct the circulation through the veins without interfering with the arterial current. When this is accomplished a piece of wood or any other hard substance is firmly grasped by the hand, and the forearm flexed on the arm so as to increase the distension in the superficial veins. Close stopcocks *h* and *g*.



"The piston of the aspirator is now raised by turning the handle toward the right, and is retained in its position by a spring on the top.

"The curved needle *f* connected with tube *b*, which has been attached to *h*, is now inserted in the median basilic vein from above downward, the stopcock *h* turned, and the blood allowed to fill the cylinder *a*.

"Compressing the rubber tube occasionally with the thumb and forefinger will prevent the vein from collapsing.

"A vein in the patient's arm having been exposed, one of the trocars, *c* or *d*, is introduced and secured in the usual way ; the trocar should remain in the cannula until the blood is ready for injection. A small quantity of blood is now forced from the aspirator (by turning the handle toward the left, after the little spring is removed) through the tube *e* (which is of a larger calibre than *b*), to remove the air. The trocar is now withdrawn and the cannula attached to the cone of the tube *e*, and the blood injected.

"During the operation the aspirator is placed in a basin of warm water."



AVELING'S APPARATUS.

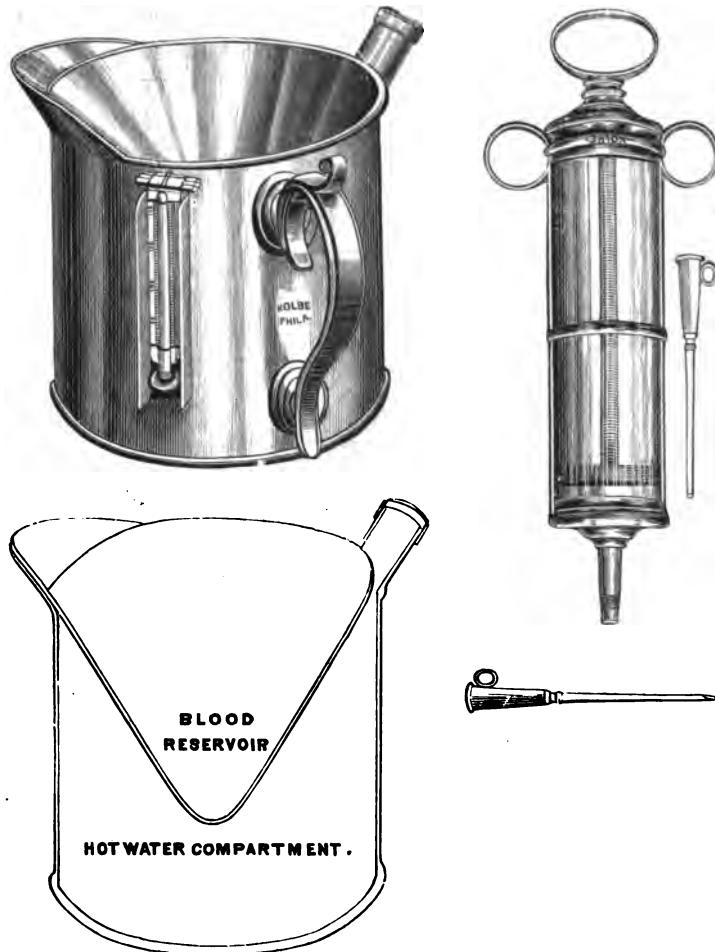
1. Assistant's hand holding tube in donor's arm.
2. Surgeon's thumb and forefinger acting as valve to prevent return of blood.
3. Same, while blood is being drawn into bulb.
4. Surgeon's hand alternately compressing and relaxing bulb.
5. Assistant's hand holding tube in receiver's arm.

If the pure blood is to be used, Dr. Aveling's apparatus is certainly the best, and it has been used with success. In this case we have an india-rubber bulb, without valves, holding about two drams, to each end of which an india-rubber pipe of six or seven inches long is fastened ; at the outer end of each pipe is a metallic stopcock. Besides these there are two small silver tubes, one round and the other bevel-pointed, to enter the veins, and a scalpel and pair of fine forceps will also be necessary. The operation is performed as follows : The bulb with its attached tubes is placed in a basin of warm water, the cocks opened, and the tubes and bulb entirely filled with water, which can be easily done by alternately pressing and relaxing the grasp until it is clear that all air has been driven out. The two silver tubes are also put into the basin and filled with water. The patient is now brought to the edge of the bed, and a small fold of skin over one of the veins at the bend of the elbow is raised, transfixed, and divided. This brings the vein into view. Meanwhile an assistant has lifted the bevel-pointed silver tube from the basin, carefully holding a finger over each end so as to retain the water. The surgeon now seizes the vein with the forceps and nicks it ; the assistant, still holding his finger over the larger end, quickly introduces the tube into the upper portion of the vein, and, retaining his finger, closes the point of entrance into the vein with the fingers of his other hand, so as to prevent all escape of blood. If the donor's arm has not already been prepared, which is better, by another assistant, it now goes through the same operation ; but here not quite so much care need be used, as a slight loss of blood can be of small consequence. The tubes having been adjusted, the ends of the rubber pipes are now fitted into the ends of their respective tubes, and the stopcocks, which have been turned so as to prevent the escape of water, are opened ; a connection is thus established between the giver and the receiver. The surgeon now presses the pipe on the side toward the giver of the blood ; the bulb is then slowly squeezed, and two

drams of water thrown into the vein of the patient. While the bulb is firmly squeezed the surgeon's fingers leave the pipe on the side of the giver, and the pipe on the side of the receiver is compressed, by which a return of the water is prevented, and, the bulb being allowed to expand, two drams of blood are drawn into it, when the previous operation is repeated, an injection of two drams of blood being made, and this process is repeated as often as may be deemed necessary. This seems to be the most approved method of using the Aveling apparatus, but I am not sure that it could not be improved upon. Certainly Dr. Aveling's original suggestion of inserting the giver's tube, with bulb and pipe attached, and holding it up so as to allow it to fill with blood, and then inserting the pipe with the free end into the receiver's tube as before, is not a bad one, if properly managed, and avoids the necessity of injecting any amount of water. Nor am I sure that an apparatus with valves, something like the Davidson's syringe, would be objectionable, though of course it is of advantage to have as few points as possible to attract clot.

The instrument which I have used for years, and which still appears to me well suited to the purpose when defibrinated blood is to be used, was slightly modified from that of Dr. Allen. It consists essentially of a blood receiver, syringe, and cannula. The receiver is, as you see, a cylindrical vessel, made of German silver, six inches in diameter and six inches in height, having at its upper edge a short metal tube closed by a screw top, and one-half inch in diameter, through which warm water is introduced into the lower part of the vessel. On the outside is a thermometer, the curved bulb of which lies in the chamber, and by which the temperature of the water is regulated. In the interior of this receiver is an inverted cone, gilded on the exposed surface, and dipping down into it, so as to be surrounded by the hot water, though there is, of course, no connection between the water and the interior of the cone. The syringe is of glass, five inches long by one in width,

metal bound, with hard rubber at each end, and holding two ounces, a tapering rubber nozzle one and one-half inches long projecting from one end, while at the other is the ring at the end



of the piston-rod. Besides these we have a steel cannula, two inches long and one-twentieth of an inch in diameter, to which is attached a conical metal neck, into which the end of the syringe fits. The

cannula is, of course, fitted with a trocar. There should also be at hand a tumbler or bowl surrounded by hot water, a fine piece of linen for straining the blood, and some half-dozen little bundles of broom-straw, which can, as I have before mentioned, be easily made from a new clothes whisk or broom. Lancets, forceps, and whatever is necessary for the opening of a vein will also be required.

The method of operating is as follows : The giver of the blood (a vigorous man should be chosen if possible) is bled in the ordinary way ; that is, a bandage is bound firmly above the elbow, the hand is made to grasp some hard substance, and a convenient vein is opened near the bend of the elbow. The blood is drawn into the receiver, previously filled in its lower receptacle with warm water, T.  $110^{\circ}$ , and lightly whipped with the broom whisks, fresh ones being substituted when the first become coated with clot. This operation will take two or three minutes. The blood is then carefully strained through the linen into the tumbler surrounded by warm water, and the receiver being washed the defibrinized blood is replaced. While all this has been the work of an assistant the surgeon has exposed a vein in one arm of patient, tied a ligature firmly below, and placed a knot loosely above the point where the opening is to be made. The vein is now lifted and nicked, and the cannula inserted, and the tube allowed to fill with blood.

The syringe, into which blood has been drawn from the "receiver," is now fitted into the end of the cannula and held with its end rather downward, so that any air may rise to the handle end. It should not be completely filled, so that the piston when all is ready, being drawn back a little, may extract any remnant of air from the tube. And now the injection may be slowly commenced and repeated without trouble as often as necessary. Of course, when the syringe is removed, the free end of the cannula is closed with the finger, and by the same means blood is prevented escaping from between it and the sides of the vein. When the

operation is completed the cannula is withdrawn, and the upper ligature firmly tied, thus preventing all escape of the injected blood. At times I have injected the radial artery in the same way ; but, of course, in that case, tying it firmly above and injecting toward the hand. Where there is any fear of clot this plan gives the advantage of straining the blood through the capillary system of the hand before it enters the general circulation, and also to a certain extent obviates the danger of shock ; but, as a rule, I consider the injection of a vein the better mode, at all events for beginners, and if you have difficulty in finding a collapsed vein in the arm open the saphena vein at the ankle, which I have done very successfully, for it can always be readily found.

I have thought it best to thus carefully give you all the steps of the operation as conducted by others and myself, but I wish especially to impress on you that the operation, with ordinary care, may be considered a safe one ; and I charge you to let no person die in an emergency, as from post-partum hemorrhage, merely because you have not all the specified implements. A pocket-case, a small syringe, and fresh blood is all that you will find necessary, and when great haste is required I should not hesitate to inject the blood without defibrination. Only be reasonably careful of clot and air, and especially avoid throwing in the blood rapidly. It can hardly be thrown in too slowly.

Of other dangers of transfusion I have not spoken because I do not know of any, and I believe that where convulsions and other unfortunate complications occur they are generally due to the overpowering effect of a quantity of blood suddenly driven in on a weakened heart and depressed nervous centres. As to the amount it must depend on circumstances. The successful injections have ranged from over a pint to one or two drams. Undoubtedly a very small quantity of blood has often a wonderfully tonic and invigorating effect, like that sometimes experienced immediately after taking food. Where the body is wasted by disease,

and the blood supply has long been bad, great care and a small amount must be used ; but in cases of sudden and severe hemorrhage, unaccompanied by other shock, you may be bolder, and I should not hesitate to advise that six or even ten ounces would be correct.

Having had, as previously stated, no personal experience of the effects of transfusion in cases of post-partum hemorrhage, I have not thought it necessary to do more than favorably mention the operation to you in such cases ; there is no doubt, however, that in this difficulty one of the most successful fields for transfusion will be found ; and when the before-mentioned symptoms of collapse from loss of blood are present, and the system fails to respond to the usual remedies, I advise you to transfuse without delay.



## **HYDROCELE.**

BY

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THE patient before you, gentlemen, furnishes an example of hydrocele. This disease consists in an effusion of serum into the cavity of the tunica vaginalis testis. It possesses the characteristics of fluctuation and translucency. It is a very common disease, and so frequently not recognized that I may be pardoned if the present hour be occupied with its consideration.

*Diagnosis.*—Hydrocele in the adult is liable to be confounded with hernia, varicocele, hæmocele, sarocele, and encephaloid disease of the testis. The error is so common that a little time spent upon the subject of differential diagnosis will not be out of place.

How can hydrocele be distinguished from hernia? Let me place the leading differences side by side :

### *Hydrocele.*

The swelling in hydrocele commences at the most dependant part of the scrotum, and gradually ascends toward the external ring.

Hydrocele, when once formed, is a permanent enlargement, and not influenced by position.

### *Hernia.*

The swelling in hernia commences above at the external ring, and descends toward the bottom of the scrotum.

Hernia (if reducible) recedes and disappears when the patient assumes the recumbent, and reappears when he is in the erect position.

In hydrocele the form of the swelling is cylindrical or ovoid.

In hydrocele the tumor on percussion yields a flat sound.

In hydrocele palpation communicates the sense of fluctuation, and coughing no succussion or impulse to the fingers.

In hydrocele the tumor has a tense look, stands off from the body, and when pressed toward the perineum and then released, springs back to its original position.

In hydrocele the swelling can be illuminated by artificial light, and becomes translucent.

With so many points of distinction between the two diseases, a mistake appears to me to be inexcusable, and yet I doubt not the experience of every surgeon furnishes many examples of this error. A short time since I was called to see a case of hernia, into which a trocar had been thrust, supposing the tumor to be one of hydrocele.

How may we distinguish hydrocele from varicocele?

*Hydrocele.*

Hydrocele presents a smooth and a uniform surface.

Hydrocele, on pressure, appears to be homogeneous in consistence.

Hydrocele is not affected by recumbency.

In hernia the form of the swelling is pyriform or round.

In hernia, should the contents of the sac consist of intestine, the percussion sound will be resonant.

In hernia there is an absence of fluctuation, and the presence of succussion in coughing or straining.

In hernia the integuments do not appear tense, and the tumor is pendant or pendulous rather than prominent.

In hernia the swelling is opaque.

*Varicocele.*

Varicocele presents an irregular surface.

Varicocele feels as though made up of a congeries of contorted cords.

Varicocele disappears when the patient assumes the recumbent position.

Hydrocele rarely causes pain along the cord or in the lumbar region.

Varicocele frequently produces pain in the course of the inguinal canal and in the loins.

In consequence of a blow or fall in which the scrotum is injured, a free hemorrhage occasionally takes place within or without the cavity of the tunica vaginalis, forming a hæmatocoele. To distinguish this from hydrocele, the following comparisons may be made :

*Hydrocele.*

Hydrocele appears usually without having been caused by external violence.

Hydrocele is elastic and rather light.

Hydrocele is translucent.

The integument in hydrocele is free from discolouration.

*Hæmatocoele.*

Hæmatocoele generally produced by an injury.

Hæmatocoele is more solid and heavy.

Hæmatocoele is opaque.

The integument in hæmatocoele is often discolored in consequence of the injury, and always so when the extravasated blood is exterior to the tunica vaginalis.

Sarcocele and encephaloid disease of the testes, while they have a certain resemblance to hydrocele, are not so likely to be confounded with the latter as the affections already described. The following characteristics which belong to sarcocele are quite sufficient to establish the difference, namely : hardness, irregularity of surface, weight, and the absence of fluctuation and translucency. Encephaloid disease of the testis, in consequence of the tendency to the formation of cysts filled with fluid and serous effusion into the tunica vaginalis, possesses in some respects a stronger resemblance to hydrocele than does an enlarged testicle. The differential features will appear in the rapid growth ; hard, irregular nodulated surface ; implication of the inguinal glands ; want of

general translucency ; a pronounced cachexia, and a rapid loss of flesh and strength—phenomena which belong to malignant disease.

There is a form of hydrocele in the adult which has been called encysted, and which possesses certain notable peculiarities which serve to distinguish it from the ordinary form of the disease. The affection usually begins in either the semeniferous tubes of the gland or the epididymis, and is perhaps obstructive in its character, resulting in an inflammatory effusion. At first the swelling is confined to a very limited portion of the scrotum, corresponding to where the cyst rises from the tunica albuginea, and may appear as a single or double enlargement. These cysts, in addition to serum, contain also spermatozoa. Finally, in all cases where doubt hangs over a case, the exploring needle should be employed in order to clear up the diagnosis.

*Treatment.*—Ask four or five surgeons how they treat hydrocele, and you will perhaps receive as many different answers to your question. One will tell you, I lay open the swelling and excise a portion of the tunica vaginalis ; a second will say, I introduce a seton ; a third will advocate exposing the sac and mopping it well with some stimulating fluid ; while a fourth will express his preference for injection. All of these plans doubtless succeed. I have employed them myself. The most simple of all methods is that by injection. It is an operation of elegance, can be done quickly, involves no great amount of skill in its execution, is followed by a short continuance of pain, and above all, is almost uniformly successful in effecting a cure. It is to this plan that I give an unqualified preference. Not on hypothetical or presumptive grounds, but for reasons which alone should influence the surgeon in dealing with questions which affect human health, namely, the uniform experience of success. It is a mark of great rashness when a writer commends or condemns, without having concentrated upon the subject in question all possible evidence which can enlighten

and satisfy the judgment. Why is it that there has been such a discrepancy of views in regard to this simple measure of injection in hydrocele?

Are remedies and operations, like empires, to have their rise, culmination, and decay? Why should the results of professional observation be so conflicting? Why is it that one man eulogizes and another anathematizes the same method, the same remedial agent? The fault, gentlemen, is generally not in the method, But in the execution of it. When I am informed on creditable authority that by a given plan, for the cure of a particular disease, only three cases failed in eleven hundred and forty-eight patients (Fro-riep, N. Notizen, Vol. 8, Nov., 1836), I must accept it, respect it, try it; and if a similar success does not take place in my own experience, infer some important omission in its employment has been made. The fact is, the tendency of the times is destructive ; it demands, like the Athenians of old, "*something new,*" and lays violent hands on the best established methods of our art. In indulging in these remarks we have no wish to discountenance investigation, interrogation, or experiment, only to insist that the dignity and simplicity of the profession shall not be tarnished by prostituting the power which it possesses over the popular mind to purposes of display or personal singularity. A few silver threads deposited in the sac of a hydrocele may seem very artistic ; the ex-cision of the vaginal tunic will yield more blood and attract more attention than an unpretending injection ; but, after all, with the last the disability is less, and the result as sure. The use of the injection in hydrocele is due, according to Dr. Munro, to a sur-geon in the Scotch army of his own name, during the beginning of the last century. The remedy which he first used was spirits of wine ; afterwards wine. The violent inflammation and suppuration which sometimes succeeded the use of the first brought discredit upon the practice, especially among British surgeons. Mr. Pott speaks of it as an operation which, happily for mankind, has been

laid aside, although he lived long enough to alter his opinion. In France they continued to employ injections, using milder fluids, and securing favorable results, as stated by Sabatier, until, finally, the practice became popular in England, mainly through the labors of Sir James Earle.

The opposition manifested to this plan arose from different notions as to subsequent effects. Mr. Sharp was afraid of the violent symptoms produced by the spirits of wine. Mr. Douglas thought that the distance between the two layers of the vaginal tunic would render exactness and uniformity in their contact impossible. Le Drun adopted the same view. The theoretical notions of cure, entertained by the two authorities last named, have an extensive prevalence at the present time ; that is to say, the removal of the disease by an inflammatory consolidation or cementation of the two layers of the tunica vaginalis in its entire extent, thus obliterating its cavity altogether. Whether this ever takes place to such a degree I am unable to say ; but that it is not necessary for the extinction of the disease I very well know, having had an opportunity of examining the parts in a case where the injection had been employed. Bands of organized lymph were found intersecting the cavity of the tunica vaginalis at several points ; a very limited adhesion existed at two or three other localities, but the largest portion of the walls of the sac remained separate ; its surface, however, entirely changed, having an irregular, dull, dry, and fibrous appearance. The fluid used by Earle was port wine diluted one-third with a decoction of rose leaves. The great improvement in the injection, however, consisted in the introduction of the tincture of iodine, an agent possessing singular efficacy, and producing, when properly used, just that degree of inflammation which yields the properly tempered lymph, and without any tendency to excite suppuration. The credit of its application to the treatment of hydrocele belongs to Velpeau, although it is alleged to have been well known to the physicians of India. If it has

failed to answer the expectations of surgeons, I am bold to say the fault is not in the iodine, but in the manner in which it has been used. Some advise that this agent should be allowed to remain only a short time in the sac, say a few minutes, and then be withdrawn ; others think that the iodine should be largely diluted with water before using it as an injection, and in such a quantity that the tunica vaginalis shall be well distended before the withdrawal of the mixture. Just here, we think, lies the cause of failure, when failure occurs. The undiluted officinal tincture of iodine should be thrown in and allowed to remain. The India physicians, it is said, adopted this course, and Mr. Syme strongly *insists* upon it, using very strong language against all attempts to resuscitate the seton in any form whatever. I shall proceed to illustrate, in the case of this patient before you, the operation which *I have* done a great many times, and always with a successful result when its details have been observed. One failure only can I recall : a case of unusual magnitude, measuring sixteen inches in circumference, and with a vaginal tunic greatly thickened. This case was cured by excision, although, perhaps, had a larger quantity of the iodine been used the result might have been different. But to proceed : making the walls of the scrotum tense in front of the testicle, the surface is carefully inspected, with a view to avoid any venous trunks, and this small trocar thrust in, a short distance from the most dependent part of the swelling, and in a direction somewhat oblique to its longitudinal axis. The absence of resistance assures me I have reached the cavity of the tunica vaginalis, the trocar is withdrawn, leaving the canula *in situ*, and you see the stream of straw-colored fluid escaping into this cup. I am careful to empty the sac of all the fluid possible, and now I can examine the testicle to discover if there be any enlargement or undue sensibility which might render it improper to attempt a radical cure. Finding nothing of this nature, the nozzle of this syringe, which is charged with two and a half drachms of the tincture of

iodine, I insert into the canula, and pushing forward the piston, empty the contents into the serous sac. The parts are now rubbed together so as to diffuse the liquid over the entire surface of the membrane, and the canula withdrawn, leaving all the tincture in the sac. The patient begins to complain of a sharp pain, which in a short-time will reach the back and produce, perhaps, a sickening sensation. This is the operation by injection ; exceedingly simple and almost infallible. This patient must now return to his bed, and something be placed under the scrotum to give it the requisite support. If the pain continues long and is very severe, he should have half a grain of morphia. His diet should be moderately restricted for two or three days. By the third day the swelling will have increased to nearly its original size, and so remain probably for twenty-four or thirty-six hours, when it will begin to subside. At the end of the seventh day the patient may put on a suspensory bandage and get out of bed, going about as he may feel able. In three or four weeks the swelling will have all disappeared and the cure be accomplished.

*Infantile Hydrocele.*—Another form of hydrocele is that belonging to infantile life, and, as in the hydrocele of the adult, the disease is often confounded with other and very dissimilar conditions. In several varieties of infantile hydrocele there is an anomaly of development operating to cause the affection. The descent of the testicle prolongs a portion of the peritoneum along the inguinal canal down into the scrotum, and which becomes the tunica vaginalis testis. Should no arrest follow in the subsequent normal changes, all of that part of the prolonged peritoneum which surrounds the spermatic cord,—that which is called the funicular process,—contracts firmly about the latter, so as to form a close investing membrane extending from the internal to the external abdominal ring, while that part below the external ring, and surrounding the testis, remains an open sac. By these changes the cavity of the tunica vaginalis, and the cavity of the abdomen, have no communि-

cation the one with the other. Suppose, however, the funicular part of the peritoneum does not close tightly around the cord, then the continuity between the two cavities remains uninterrupted, and, as a consequence, the serum from the serous membrane of the peritoneum trickles down along the cord into the vaginal tunic of the testis and forms the so-called congenital hydrocele.

In other cases the funicular process becomes closely adherent to the cord at the external ring, but remains an open pouch above. Should a collection of serum form in the latter it constitutes a hydrocele of the cord. This condition is in some instances accompanied by a collection of fluid in the vaginal tunic below the ring, making a double, unilateral hydrocele. In rare instances the funicular process of peritoneum is left adherent at two points in the course of the cord, and separated at the intermediate portions, forming two distinct sacs, which when distended with fluid forms a bilocular hydrocele of the cord ; and lastly there may be no interruption or arrest in the development, the entire cord being closely embraced by the tubular extension of the peritoneum, in which case, should a hydrocele occur it will be situated in the tunica vaginalis testes, constituting infantile hydrocele. In the diagnosis of these different forms of the disease these anatomical peculiarities should be kept in view. They are often mistaken for hernia, or undescended testicle. In considering the first variety, that of congenital hydrocele, the following considerations will generally answer to establish the true nature of the disease. In both hernia and congenital hydrocele the tumor appears in the erect and disappears in the recumbent position ; but in the former the recession, either spontaneously or by taxis, is the work of a few seconds, and is usually accompanied with the sensation of gurgling ; while in the latter the subsidence of the swelling is slow, in consequence of the difficulty which the fluid experiences in passing back into the peritoneal cavity. It is supposed by many

that in congenital hydrocele the communication between the abdomen and the vaginal tunic of the testes is free, in other words that the cord lies loose in the funicular process. Such, however, is not the case. Though not adherent at all points, yet this process is in contact with the cord, in the entire extent of the inguinal canal, and in some places firmly adherent. Were it otherwise, a portion of the intestine would descend as readily as the fluid, and we should have both hydrocele and hernia. Again, the test by artificial light will serve to distinguish the two ; the swelling being translucent in the first, and opaque in the last.

In hydrocele of the cord, the same tests serve to establish the true nature of the disease. To derive the full advantage of light as a means of diagnosis the patient should be examined in a room entirely dark ; the swelling being made tense by compression between the thumb and fingers of one hand, while a lighted taper held on the opposite side to that occupied by the surgeon, a hand being interposed between the latter and the light, brings out the translucency, if present, with satisfactory distinctness. To distinguish hydrocele of the cord from an undescended testicle, we have only to compress the swelling, when, if the case is one of the latter kind, the child will exhibit unmistakable signs of suffering, which will not be the case if the tumor only contains fluid. In this, as in every variety of the disease, the illumination of the swelling should never be omitted. In bilocular hydrocele of the cord, the diagnosis may be satisfactorily established by the light test ; by the unreducibility of the swelling, and by the introduction of the exploring needle. Infantile hydrocele of the testicular portions of the vaginal tunic is a pyriform swelling, very translucent, and the scrotum on the affected side being prominent rather than pendant.

There is considerable diversity of opinion as to the proper treatment of congenital hydrocele in its different varieties ; some advise injections of iodine into the sac, after the abstraction of its

contents. Among the French surgeons alcohol is quite a popular remedy. Should any one be tempted to use either of these agents in congenital hydrocele, the continuity of the vaginal tunic with the cavity of the abdomen must be remembered, in order that pressure may be made at the external ring, to prevent the fluid entering the peritoneal sac, in the event of which the patient would probably perish from inflammation.

There are four plans for managing all varieties of infantile hydrocele, which I find entirely satisfactory.

*First.* By expectancy. Many cases get well without any assistance from the surgeon, and therefore unless the tumor steadily increases in size, it may be left alone, hoping for such a termination; when the enlargement steadily goes on, an effort may be made to secure the absorption of the fluid, by the external application of a lotion of the muriate of ammonia, or by applying the compound solution of iodine.

*Second.* By pressure. When the hydrocele is situated in the inguinal canal, that is a hydrocele of the cord, and when it does not spontaneously disappear, a cure may often be effected by the application of a truss over the swelling. It is to this variety of the disease that such an instrument is applicable.

*Third.* By excision. This consists in making a puncture with a sharp-pointed bistoury into the hydrocele, and evacuating its fluid, after which the tunica vaginalis, which appears in the wound as a white membrane, should be seized with a pair of forceps, drawn through the wound, and a small portion snipped off with the scissors.

*Fourth.* By the seton. This last method is the one which I generally adopt, and which I regard as in every way satisfactory. It is applicable to all varieties of the disease, and consists in puncturing the sac with a sharp-pointed bistoury, and along the blade of the instrument introducing a needle armed with a single silk thread, which is brought out through the skin of the scrotum and

loosely knotted. The seton **serves** to drain away the serum, and to develop sufficient inflammation to **cure** the disease. The thread should never be allowed to remain **more than** twenty-four or thirty hours, after which time it must be removed. If this precaution be observed, there will be little risk of suppuration and the cure will almost invariably follow.

*Hydrocele in the Female.*—When hydrocele occurs in the female it is located in those parts which constitute the analogues or complements of the spermatic cord and scrotum in the male, namely, in the funicular process of peritoneum which invests the round ligament as it lies in the inguinal canal, and in the cellular tissue of the labium.

The diseases with which hydrocele in the female may be confounded are hernia, cysts, varicose veins, and oedema. When the fluid is situated in the tubular process of the round ligament, or in the labium, the varieties of rupture which it resembles are, in the first case, inguinal, and in the last, obturator hernia. The distinction can be established by attention to the following particulars : In hernia the tumor will be compressible and reducible, and in the act of coughing or straining will communicate to the hand a marked impulse. None of these peculiarities belong to hydrocele. In the case of cystic growths the differential points are not so easily recognized ; it will however be found that cysts are sharply circumscribed, and project from the mucous surface of the labium ; the swelling in hydrocele is more diffused, and extends equally in all directions. In doubtful cases the exploring needle will impart much valuable information. In cysts, instead of the fluid being clear or straw-colored, it will be dark and often tinged with blood. Occasionally the labial veins become varicose, forming a considerable mass on the inner surface of the labium. In the recumbent position such a swelling subsides, or can be readily removed by pressure ; the mucous surface presents a purple appearance, and the tortuous arrangement of

the dilated veins can be felt. Hydrocele professes none of these characteristics. Cœdema of the labium is often occasioned by pressure upon the pelvic, or abdominal veins, produced by the gravid womb, or by ovarian and uterine tumors. Such a swelling possesses many characteristics in wide contrast with hydrocele. In cœdema there is neither fluctuation nor translucency present ; the parts have a doughy feel, and when pressed upon "pit," retaining the depression made by the finger for some time.

*Treatment.*—Hydrocele, whether in the sheath of the round ligament, or in the labia majora, demands no surgical interference so long as the disease shows no tendency to increase. If, on the contrary, the accumulation steadily progresses, it should be treated by the injection of iodine ; after which, if the disease was located in the funicular process of the round ligament, a light pressing truss, with a soft pad, should be applied, as soon as the inflammation incident to the injection has begun to decline, in order that the parts may be maintained in close approximation.

In infantile hydrocele of the round ligament, injection, if used at all, should be very carefully managed. The tubular process of the ligament is likely to be open next to the abdomen, and if so, would permit the fluid to pass into the general peritoneal sac. Pressure over the upper part of the inguinal canal might prevent such an accident ; but it is safer and equally efficient to employ the seton, by introducing a single silk thread into the sac for thirty hours. Let me however say, that infantile dropsy of the round ligament will in most cases undergo a spontaneous cure, or if very slow in disappearing, may be facilitated by the application of a truss, and in consideration of these facts it is better not to operate prematurely.

When the fluid is situated in the labium the cellular tissue will generally be pressed aside and condensed, so as to form a

single sac, and in such cases the iodine injection will effect a cure with the same certainty as the hydrocele of the tunica vaginalis of the male. Should this not prove to be the case, a closer investigation of the growth will probably prove it to be a cyst, in which event, nothing short of the excision of its sac or wall will eradicate the disease.

## THE PHILOSOPHY OF MENSTRUATION, CONCEPTION, AND STERILITY\*

BY

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THE two cases, Nos. 49 and 50, which present themselves today are peculiarly interesting on account of their dissimilarity of pathological import, as well as the connection they bear towards the same subjects, viz.: menstruation, conception and sterility. It is not often that we are fortunate enough to be able to consider these conditions in two cases offering themselves for the first time and on the same day.

*CASE 49. (History.)*—Mrs. Rose Dunn, born in N. Y., aged 20, began to menstruate at 11 1-2. On the very first day of her menstruation she received a severe kick in the genitals, after that, she menstruated very irregularly, varying from 2 1-2 to 3 1-2 months, which continued for a period of five years when she married, conception ensuing 12 months thereafter. Since the birth of her child the irregularity of menses has continued as to time, and she has menorrhagia with the expulsion of blood-clots. She has headache, anorexia and constipation.

*Physical Examination.*—I will make a digital examination to observe if there be a symmetrical arrangement of the parts, and if there be any sensitiveness, heat, swelling, enlargement, in-

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\* A lecture delivered at the Clinique for the Diseases of Women at the University Medical College, April 12, 1877.

duration or laceration. The minute the finger is introduced into the vagina she shrinks in consequence of increased hyperæsthesia. The uterus is low in the pelvic excavation, but not over-much for a women of her small stature. In a tall woman it would be under similar conditions relatively higher, because of the greater length of the vagina, correspondingly longer as the bodily height is greater. Inspection of the external genitalia reveals nothing abnormal. By conjoined manipulation we discover that the uterus is increased in its longitudinal and lateral axes, and is fixed to the perimetric tissues as it would be in chronic pelvic cellulitis. Upon withdrawing the finger we find it covered with the leucorrhœal discharge peculiar to catarrh of the lining membrane of the neck, which is very tenacious and viscid in character, and yellowish white in color. To complete the diagnosis, we must farther examine the patient with the Sims speculum. The speculum being introduced, those of you who are near, are enabled to see the swollen and tumefied condition of the intravaginal cervix, almost purple in color, and the ropy muco-purulent discharge plugging the external os. Thus far we are enabled to state that we have a case of metric and perimetric chronic congestion, with hypertrophy of the entire organ. By the introduction of a flexible block tin sound, we will farther determine the actual increase in the length of the cavity, as well as the sensitiveness of the mucosa. I bend the sound somewhat sigmoid in shape, and by making a double rotary movement of the handle from before backwards and from left to right, it slips in without much pain, but by pressing it with some firmness upon the fundus she shrinks and complains of its hurting her very much. The tip of the sound, upon its withdrawal, is covered with bloody mucus, and a slight flow of blood exudes from the cervical opening. You observe that in passing the sound I have steadied the cervix with a tenaculum. I never introduce the sound in any other way.

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However skillful one may be, it is never safe or prudent to catheterize the uterus without first mapping out its axis by conjoined manipulation, and then bending the instrument, which is nothing but a probe after all, to correspond to the canal, otherwise we are liable to injure the lining membrane, and I have known of the organ's having been penetrated by the unyielding Simpson's sound. The length of the canal by actual measurement is 3 1-4 inches.

*Diagnosis.*—Hypertrophy of the uterus from sub-involution, chronic catarrh of the mucous structure, with chronic congestion of the whole organ, and perimetral cellular thickening and fixation.

*Treatment.*—The treatment will be catharsis to relieve the portal vessels and thereby empty the hemorrhoidal and uterine plexuses. Hot douches to the cervix, twice daily, to overcome the mucous-membrane hyperæmia—an abdominal bandage to lift the superincumbent viscera from the pelvic excavation. After about three weeks of frequent catharsis and hot douching, it will be well to faradize the uterus thrice every week and to put her upon ergot. Local treatment to the lining membrane is not at present of much service, as the catarrh is but symptomatic of the textural hyperæmia. Cleaning it with hot water by means of this instrument (a perforated catheter with a steel spring attached to keep the internal os well opened thereby permitting the fluid to flow freely from the uterine cavity) will be advantageous, as it prevents the retention and decomposition of muco-purulent and bloody discharges. The prognosis with regard to her uterine trouble is favorable, but the consideration of her menstrual irregularities is another question and we will have to study her case with care, and watch her for many months to determine if the uterine trouble be the cause, or if it be but a coincident factor, the result of her parturition nearly two years since. Every symptom she

presents may be the result of child bearing, but as she presented many of them from the earliest menstruations, when she was not twelve years old, we cannot be accurate in our diagnosis until we have had time to reach it by exclusion.

The consideration of this case is fraught with great interest, as it involves many questions of physiological import which are by no means yet settled. The fact that she menstruated early in life (11 1-2) presents nothing very prominent, although the average period of menstruation in women living in the temperate zones is about 14, whilst that of those who live in tropical and sub-tropical regions is about 12, and in the colder climates, ranging from Northern Russia to Greenland, 16 to 23.

This woman menstruated early, much earlier in life than most women, and on the very first day of the menstrual flow received a kick in the genitals, which really is nothing in the evidence as regards the subsequent irregularities unless it produced certain traumatic results, of which she makes no mention, such as an intra-labial hemorrhage, known as thrombus or laceration of the pudendal or perineal tissues. Usually, such a severe blow, as would be produced by a kick, would be followed by a blood-effusion in one or the other labium varying in size from a hickory nut to an orange. I have seen several instances where women were so injured that the vaginal and clitoridal bulbs were ruptured, and enormous distention of the labia ensued. Usually these intra-labial ecchymoses are followed by no very serious trouble and the blood is absorbed after a few weeks, but sometimes the coagulum remains, becomes organized and may be the nucleus of a distinct tumor, or it may break down, become disorganized to be followed by abscess, and I have known one to be succeeded by a pudendal hernia. This is readily understood when we recollect that the round ligament of the uterus, the analogue of the spermatic cord of the male, passes through the ring into the canal of Nuck to be

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lost in the dartoic sac of labium majus. The patient before us however, gives us no history of herself that would lead us to believe that she labored under any one of these conditions.—She only mentioned that up to the period of her marriage she menstruated irregularly as to time, and sometimes had menorrhagia attended with the expulsion of clots. It is hardly probable that the kick delivered to so young a child would have so influenced her emotional life as to be followed by deranged menstrual flow. We must seek the cause in other localities than the actual physical conformation of the uterus and ovaries. There was some paresis of the trophic nerves distributed to the generative circle. Physiology has pointed out the natural history of ovulation, and we are enabled to trace the migration of the ovum from the deeper to the peripheral layers of the ovary, from a simple cellule to the complex organization of the Graafian vesicle. We know how this vesicle ruptures, discharges its contents in the uterus through the Fallopian tubes—we likewise know that the entire generative circle becomes engorged with blood, the menstrual fluxion and congestion, that the uterine mucosa, after a few days of such intumescence, breaks down through fatty generation and disgorges the blood accumulated in the vessels of that and the underlying tissues, and after bleeding for a certain period, usually three or four days, the whole structure shrinks, remains quiet for some fourteen days, and then again renews the activity just described. Every menstruation, therefore, is a little parturition, a delivery on a small scale, an unfinished birth.

These facts do not explain the cause of menstruation, nor do they thoroughly demonstrate how much of the organism or what portion of the generative circle is absolutely requisite to the performance of the function, farther than the bleeding from a healthy woman's uterus takes place for a certain number of years, at stated intervals of about twenty-eight days, unless

pregnancy supervenes, and that after about thirty years of such work there is a cessation never to be again resumed.

From facts I will cite you, I think you will agree with me that menstruation proper is a neurosis indicating anatomical change, hyperplastic action, degeneration of tissue, and reparative process. It is coincident with, if not dependent upon ovulation, and the latest theory of independent uterine action without ovarian causation is not susceptible of proof, as I have seen one case where periodical fluxion to the pelvic organs, with relief to that fluxion by hemorrhages from the mouth, the lungs, the stomach and the rectum, first one and then the other form of so-called vicarious menstruation, where *no uterus existed*, and in its stead, there was only a rudimentary organ no larger than an almond. There is no well authenticated case on record, where anything approximating menstruation ever took place with *congenital absence of the ovaries*. There is no doubt that periodical hemorrhages from the genital passages have taken place after the removal of both ovaries, and even after an extirpation of these organs together with the larger portion of the uterus. Yet this bleeding was not menstruation, but it strongly confirms the neurosis theory of the philosophy of menstruation. It establishes the fact that a periodical blood discharge is the result of physical conformation, dependent upon ultimate cell-change in the cerebro-spinal centres transmitted to the generative ganglionic system.

This cell-change acts as a stimulant, and is conveyed from the cerebro-spinal through the ganglionic system to the vaso-motor and trophic nerves, distributed to the generative tract, producing a pelvic fluxion to be succeeded by uterine and ovarian hyperæmia. Menstrual hypertrophy ensues, and certain mechanical results (to be explained when we consider Case 50) from blood-distention, change the relative positions of the ovaries and oviducts. At this epoch of these processes, the

fimbriated extremity of the tube has embraced the ovary in order to receive the ovum extruded from the ruptured Graafian vesicle, which enters the uterus, after travelling the route of the whole oviduct, and if impregnation has ensued, it attaches itself to the uterine mucosa, to be amalgamated with it, by and through a special hyperplasia developing the decidua and ultimately the placenta and the contained foetus. If no impregnation has taken place, the ovum passes out with the uterine discharges and sometimes after impregnation, sinks to the inferior segments of the uterine cavity and is implanted at the internal os, to inaugurate that dangerous condition known as *placenta prævia*.

Quite a number of cases have been collected where so-called menstruation ensued after the removal of both ovaries, and Dr. John Goodman, of Louisville, has tabulated twenty-seven facts of this nature, and in this table quotes one from Peaslee's work on "Ovarian Tumors," where the woman "*menstruated regularly from the cicatrix and vagina*" after the removal of both ovaries and the entire supra-vaginal portion of the uterus. Here is testimony that even the uterus is not necessary for periodical blood discharge *per-vaginam*. This case, in addition to one on which I operated in August 1869, for absence of vagina with rudimentary uterus, clearly indicates that the processes of intumescence, engorgement, fatty degeneration and desquamation of the lining membrane of the uterus, are not the causes but the effects of the menstrual molimen. The case upon which I operated, was that of a young girl nineteen years of age, who since the first pubertic developments at fourteen, had been subjected to monthly molimina unattended with genital discharge, but accompanied with vertigo, epistaxis, haematemesis, bronchial, or rectal hemorrhage, either separately or conjoined. Physical examination revealed well developed mammae, external genitalia, and vulva, but absence of vagina with rudimentary uterus and well-developed

ovaries. After a successful effort in the establishment of a tract between the bladder and rectum corresponding to the vagina, for a period of eight months, when I had her under my observation, this girl had a periodical discharge of blood every twenty-eight days from the artificial tract, and no vicarious menstruation as before the operation. Of course there could be no discharge from the uterus, as none existed. The blood came from the pelvic vessels and was transuded in consequence of a process similar to osmosis. These cases prove that the pelvic monthly periodical blood discharge *once set up*, may continue when neither ovaries nor uterus exist, and that menstruation is not solely and peculiarly a uterine function inseparable from ovulation. However, we may deduce one fact from these phenomenal cases, and that is, when the stimulation of the vaso-motor system coincident with pubertic pelvic development is once aroused, it abides in the ganglionic system similar to those molecular changes which take place in all the ultimate-cells presiding over automatic life. Other cases than those enumerated by Goodman, particularly those collated by Dr. Ely McClellan, of Louisville, and quoted by Dr. A. Reeves Jackson, of Chicago, in the American Journal of Obstetrics, October, 1876, are likewise corroborative of the theory that menstruation is absolutely and unqualifiedly the resultant and not the cause of either uterine or ovarian action. These cases also indicate that neither the uterine-unity nor the ovulation theory is the correct one. In fact, so many cases are recorded where the function entirely ceased after double ovarian extirpation, that we are compelled to seek the cause for menstruation in neuric origin, that the uterus and ovaries are designed as media to complete the work, just as the liver is constructed to eliminate bile or the brain to evolve thought. The generative system is peculiarly endowed with plexuses of nerves of remarkable intensity, and, notwithstanding, we have as yet not

been enabled to demonstrate the existence of trophic nerves, which govern and equalize the fluxionary movements, erectile and subsidence peculiar to the female pelvis, we are positive of their existence, as no action in the human economy is performed without physical factors. Emotional as well as physical causes arouse molecular nerve change in the woman's pelvis, evidenced by the sudden cessation of menstruation, or an equally sudden uterine hemorrhage, or in the production of pain. We constantly meet with these phenomena in an apparently physically healthy woman, and we can only explain the causation upon the basis of *ganglionic irritation* induced by molecular disturbance in the centripetal or centrifugal system, so intimately allied with the trophic nerves. That menstruation is a neurosis is evidenced by every variety of cerebral and spinal irritation, incorrectly attributed to the blood discharge, when the flux is the consequence. These neuric irritabilities manifest themselves from a simple psychical exaltation to a complete loss of consciousness, perception and volition. Until we actually trace the nerves and ganglia of the female generative circle to and from the cerebro-spinal axis, we must accept facts without being able to explain them satisfactorily. From these facts together with certain anatomical data and analogies between the sexes, to be explained farther on, we must regard menstruation as a manifestation of pelvic hyperœmia producing erectile of the generative circle, the result of ultimate-cell change in those portions of the cerebro-spinal centres which preside over automatic life. The discharge of blood is the result of disintegration of the uterine mucous membrane in the healthy female, and when it takes place in those phenomenal cases where the ovaries and the uterus have been removed, or where a new vagina has been made (a rudimentary uterus existing) the blood was discharged in consequence of the irritation still

abiding in the automatic nerve centres, producing pelvic hypercsemias and fluxions removed by osmosis.

That menstruation is of neuric origin, or is peculiarly a physiological neurosis, is farther borne out from the fact that it is the only automatic function of the economy which is engrafted (after the uterus and ovaries are sufficiently developed to carry out their mission of conception and parturition), and extinguished (when the debility of senility unsuits them for farther use). If menstruation were an excretion and not an epiphénoménon, it would persist as do other automatic functions, such as bile or urine elimination from the earliest to the latest periods of extra-uterine life. Uterine and ovarian completed growth, the conditions under which they are found at puberty, arouse the cerebro-spinal automatic actions, which being stimulated, so continue to act, until the cessation of cell metamorphosis takes place when the atrophy of senility ensues. Another strong proof of the neuric origin of menstruation, consists in the erectility of the contents of the female pelvis, more particularly as these contents are embryonically and physiologically the analogues of the male organs of generation, which never become erect save under irritation of the cerebro-spinal centres, either from direct pathological or from emotional causes.

In the embryo, just as a filament may come from the excretory canal of the Wolffian body, or curve down from the duct of Müller, so we may have a spermiduct or an oviduct, and sex is developed; and, the blending of these microscopical points can be traced to the completion of the sexual organs, most decidedly analogous in formative action, anatomical relationship, and physiological function. The decided analogy of the organs of the two sexes is traced in structure, innervation, connection, and vascularization.

The organs which are especially similar are the testes and ovaries ; the vasa deferentia and Fallopian tubes ; the cremasters

and round ligaments ; the ejaculatory ducts opening upon the veru-montanum, surrounded by the prostate, and the conical cervix uteri, surrounded by its glandular structures ; the scrotum and the labia majora ; the glans penis and the clitoris ; the urethral and vaginal bulb ; Cowper's and Bartholini's glands. If, therefore, I repeat, we have such decided similarity of function and formation between the sexes, and knowing erection is coincident with menstruation, also that erection in the male is an epiphénoménon depending upon nerve stimulation, we cannot attribute similar results in the female to dissimilar causes, and very naturally presume that the fluxion of menstruation is predetermined by the conveyance of stimuli to and from the cerebro-spinal centres, which in turn develop the hyperœmia, hyperstasis, congestion and hemorrhage, the totality of which goes to make up the function known as menstruation.

CASE 50. *History.*—Mrs. Emma Herne, born in U. S., aged 25, never menstruated until her marriage at 19. Two or three days thereafter had her first supposed menses, which have continued periodically ever since, with a sense of pelvic draggings on the second day. The discharge is intermittent for the first two days, but during the subsequent two or three days it is continuous. Hard work or excessive exertion develops a slight metrorrhagia with very severe pain in the region of the sacroiliac synchondroses. During the intermenstrual periods she has a constant leucorrhœal discharge from the vagina, varying in color, consistency and quantity. She now complains of nervousness, back ache, headache and loss of appetite. In cold weather her hands and feet are covered with a cold clammy sweat, and in warm weather they burn her. She has never been pregnant.

*Physical Examination* by means of conjoined manipulation indicates a well developed uterus, normal in size, with left

lateral retroversion. Bimanual pressure evokes pain in the fundus and in the perimetric areas. Touch reveals an eroded condition of the infravaginal cervix. The entire organ is not as movable as it should be, and is somewhat fixed and adherent in the left posterior portions of the pelvic excavation. The speculum and sound corroborate the examination by touch and conjoined manipulation, and those of you who are near enough to see the character of the discharge which comes from the cervical canal will observe its exceeding great viscosity, and the extreme difficulty encountered in its removal by sponge or cotton. This tenaciousropy muco-purulent discharge can only be removed by the surgeon himself, and best done by means of tepid water thrown from a syringe. All medicated washes introduced by the patient herself by means of ordinary injections are utterly inefficient, and in a vast majority of cases they only succeed in farther converting the mucosities about the external os into a solidified plug.

*Diagnosis.*—Chronic inflammation of the endometrium, erosion of the cervix, possible shortening or non-development of the left broad ligament producing left lateral retroversion, which also explains the pain evoked by bimanual pressure in the posterior perimetric spaces.

*Prognosis and Treatment.*—With regard to her sterility, the prognosis is unfavorable for reasons presently to be given, but with regard to her endometritis very much might be accomplished by hygienic discipline, local applications of the milder astringents, with frequent intra-uterine hot water douching, together with occasional catharsis, and, what is of the greatest importance, a stringent resolution on her part to live *absque marito*. She must avoid all exciting causes liable to induce pelvic fluxions and congestions. More harm is done a patient by marital congress in one night, than good can be attained in a month's treatment by the gynæcologist whenever we find a

case such as this, with endometritis and malposition. You will get better and quicker favorable results with patients who come from a distance, or who are in well regulated hospitals, than with those who live at home in conjugal harmony and who are the recipients of their husbands' erotic embraces.

This patient very naturally asks if she can ever have a child? The answer to her interrogatory is at least but a vague and unsatisfactory one. We cannot tell her yet upon what her sterility depends. We must study her case for a certain period of time—for many months, possibly a year or two—as recovery from troubles such as her's, even under the most favorable circumstances, is slow, tedious, and uncertain. A very interesting physiological point presents itself in the inception of her history—the first appearance of her menses within three days after her marriage.

The question arises, was this a bloody discharge in consequence of the rupture of the hymen, or was it menstruation proper? Most probably it was the catamenial discharge, as it has been regular with regard to periodicity ever since, and the pelvic fluxion preceding the discharge was aroused by the erectility of the generative circle coincident with the first marital congress. At this time the ultimate-cell changes were developed in the cerebro-spinal centres in consequence of erotic influences, which might otherwise have remained dormant for a longer or shorter period of time, and the result has been periodical menstruation ever since. Another wheel in the clock of automatic life was set going, which will continue until she is about forty-six years of age, unless pregnancy or some ovarian pathological trouble interferes with its revolutions. The profound changes which follow many emotional influences, in this instance, were indicated by vaso-motor and trophic nerve action preceding and coincident with ovum maturation and menstrual discharge. The erectility of the uterus, peri-

uterine tissues, ovaries, and periovarian tissues which takes place during coition, was the telegraph operator arranging his batteries for a message to be sent through the centripetal nerves to the cerebro-spinal centres, which in turn responded through the centrifugal and the ganglionic systems to the vaso-motor and trophic nerves peculiar to the generative circle, and the result has been periodical menstruation.

The well known dissections of Traer, Rouget, Kobelt and others have demonstrated the peculiar construction of the female generative tract with regard to motility and erectile, and whenever these properties are made manifest from whatever cause, either from menstrual fluxion or erotic excitement, the uterus and ovaries undergo certain modifications in change of position and increase in size. These facts, together with some clinical observations, have induced me to believe that the old theory of the spermatozoa's wriggling themselves into the uterine cavity after simple deposit in the vagina, is incorrect, vague and unsatisfactory. Now let us consider the meaning of uterine and ovarian erectile and motility. The corpora cavernosa and corpus spongiosum of the male organ are principally made up of venous trabeculæ, and the uterus and periuterine spaces, are likewise richly endowed with cavernous sinuses and retiform plexuses. The arterial distribution, instead of being dichomatous as in the general circulation, is multiple and curled, possessing a wonderful capacity of rapid unloading, of filling the venous trabeculæ in a moment. Like the male organs, the female generative tract is capable of immense venous engorgement—rapidly under emotional causes, slowly pending the menstrual flux—in consequence of the sudden emptying of the arterial diverticula and intosculations. The anastomoses of the venous plexuses can be traced from the vestibule, around the urethra and clitoris, on either side of the vagina and uterus, in the broad ligaments and under the ovaries.

When the rectum, bladder and superficial pelvic fascia are removed in the cadaver, the uterus and ovaries sink to the bottom of the pelvic excavation, or to either side according to the inclination of the body, but if we inject the hypogastric, subovarian, and left renal veins, we see the methods of erection undergone during coition, ovulation, and menstruation. When the cadaver, under these circumstances, is injected under water, we see the uterus rise up, in the pelvis, even above the brim, the ovaries crowded towards the fimbriated extremities of the oviducts, and the normal ante-curvature or ante-flexion of the body of the uterus diminishes in consequence of the bulging forward of the anterior wall which becomes highly convex. In fact the entire uterine periphery becomes globular, and the cervix proper is increased in all its diameters, and the *external os* very considerably dilated. This dilatation of the external os is very great in cervices unaffected with connective tissue change, but even in those where we find connective-tissue atrophy, there is a decided increase in the diameter of the os tincæ. Of course these changes in size are attended with increase of weight, not only of the uterus proper, but of the entire periuterine spaces. The change of position of the uterus more or less impresses the oviducts, and very decidedly the ovaries. In the living subject, there are numerous muscular striæ running from the broad ligament to the under surface of the oviduct which markedly approximate the fimbriated extremity by pulling it towards the lifted engorged ovary. These are not put in action by injection of the cadaver, but their presence is easily made out, and the ovary is seen to be lifted, not only by following the uterus, but in consequence of the distended sub-ovarian and pampinniform plexuses. In the living subject we have the plus condition of the contractility of the round ligaments, which draws the uterus forward, pulling it down as firmly as the cremasters of the male approximate the

testes under the ring, whilst the utero-lumbo-sacral ligaments behind retract the cervix towards the hollow of the sacrum. Under these circumstances the posterior wall of the vagina is lengthened, and the engorgement of the vaginal plexuses farther increases its elasticity and tension. When erotic excitement is at its height, the intra-pelvic erectile of the female is equally as tense as is the extra-pelvic erection of the male organs, and the cavities of the neck and body of the uterus occupy a position midway between the axes of the inlet and the outlet—in a line corresponding to the centre of the upper portion of the vaginal insertion upon the cervix. Therefore, when the ejaculation of the semen takes place, it impinges upon the cavity of the cervix, and in many instances passes directly to the cavity of the uterine body. Many women contend that they can tell the very moment of impregnation from a peculiar sensation of sickening shock, not the excitability of orgasm, but a sickish sinking pain, and the probabilities are that the germinating fluid is forcibly ejaculated to the very fundus, producing a decided sensation, which, if happening when there were none of the hyperæsthetic sensibilities of coition, would give rise to very marked uterine shock or colic.

Courty believes that impregnation is always attended with erection of the intrapelvic female organs of generation, and that orgasm exists in a greater or less degree of intensity. This orgasm is not appreciated by many women, owing to a defective sensibility of certain sentient nerves, but it does not prove that the ganglionic, trophic and vaso-motor distributions are not obeying the laws of physical and physiological conformation. The summum of orgasm intensity is rather predisposed against impregnation in consequence of excessive uterine and vulvar glandular secretions, which tend to wash out the seminal fluid from the cervical cavity; besides, women as highly hyperæsthetic as are those influenced by

excessive orgasm, are usually affected by more or less of uterine catarrh in consequence of the hyperæmia engendered by repeated tense erections, which is of itself one of the most prominent bars to conception.

These facts should be impressed very thoroughly upon the professional as well as the unprofessional mind, because the enactments and administration of the laws concerning rape, illegitimacy and kindred subjects are based upon supposititious theory and unfounded evidence. Thus the very highest of European authorities, Casper, in his Forensic Medicine, asserts positively that "the most advanced physiologists deny afresh the inevitable necessity of coitus, when by that is understood the usual normal act of procreation for impregnation, and regard the act itself only as a means of facilitating the introduction of the impregnating fluid into the female organs, and which they therefore term a mechanical contrivance of subordinate value." Leuckart, Valentin, Schenk, Simeon and others report cases of impregnation by hypospadiac males, where the opening in the urethra was just anterior and perpendicular to the scrotal raphe, and that conception ensued simply from seminal deposit on the inner surface of the vulva! These citations are nothing more or less than remarkable instances of the credibility of simple-minded scientists who were imposed upon by women who sought to become notorious as soon as they discovered that they were the objects of scientific curiosity. What then would be the fate of an individual charged with rape and paternity, if the rulings of our criminal courts, most usually based upon precedent, were to go to a jury upon such unanatomical, unphysiological and absurd cases, Hence we should be extremely guarded in giving an opinion as to the violation and impregnation of a woman during sleep, intoxication, or under the influence of an anæsthetic. True, there are cases reported where wives have been etherized in

this city for the purpose of marital congress, hoping that impregnation would follow in cases of vaginismus. If conception ever ensued in these women, it was because the desire for offspring, the persistence of emotional causes continued the erection, which had been physiological and permanent during a preceding menstrual flow, thereby sufficiently impressing the generative circle to retain it in that state of fixation, I regard as necessary for all impregnation. Yet these cases of anaesthetic copulation and conception can no more be counted in evidence against the theory of generative fixation in conception, than can those cases of menstruation after removal of the ovaries be counted against the theory of coincident and concomitant ovulation. They are, at best, very doubtful, and can be regarded only as phenomenal results, remarkable for their peculiarity, interesting for their singularity, and are to be classed among the marvellous histories sometimes recounted, such as a live toad being found embedded in the solid rock!

With regard to the dilatability of the os tincæ during erotic excitement, I have seen two very marked cases, and Dr. Beck, of Fort Wayne, Indiana, published a third one some four years since, in which he makes mention of one of the cases I had seen. In the one quoted by Dr. Beck, the woman was the wife of a respectable artizan, and in every particular was a well-conducted and decent woman. During the epidemic of cholera in St. Louis in 1866, she was stricken with the disease, and had, as one of the sequelæ, a complete procidentia uteri; this in turn developed intense clitoridal frictionings, which rendered the woman's condition most unbearable, in consequence of repeated orgasm. I was consulted by her for this condition, and had repeated evidence of the opening of the external os under these frictional orgasms. When the procident uterus was returned in the vagina, and the patient put under chloroform, considerable clitoridal friction (the Cusco-speculum being used

to observe the external os) developed a very slight degree of enlargement of the mouth of the womb, not one-fifth as much as when she was not under the anaesthesia, yet sufficient to indicate that some nerve stimulation was continued to those plexuses of vessels producing uterine erection. The procidentia was cured by proper appliances, and the patient passed from observation. The second case was one of a negro prostitute who had no uterine malposition, but in whom nympho-hyperaesthesia existed to such a degree that the introduction of a round speculum was frequently followed by orgasm. In this woman I have several times observed dilatation of the external os with a very considerable hypersecretion of mucus welling from the cervix. Dr. Beck's case has been published in extenso, and is familiar to all gynaecologists.

Now I contend that conception only ensues when the germinating fluid directly enters the uterus, which it cannot do when the erectile hypertrophy is absent. All of you who have watched the treatment of uterine disease, can fully corroborate the testimony of the extreme difficulty encountered in passing an ordinary sound into the uterine cavity. I mean the amount of force required to push the instrument through the internal os when the organ is in any way normal in size—as compared to one which is hypertrophied. Again, in the vast majority of cases, the cervical canal is filled with mucus, sometimes very viscid and tenacious. Is it presumable that the spermatozoa possess such elective self-moving power that they can crawl from the posterior vaginal fornix over the infra-vaginal cervix, through the cervical canal into the uterine cavity? I think not. Even admitting that the seminal fluid is ejaculated upon the cervix, it cannot enter that cavity if there is no increase in its lumen, more particularly if the way is blocked by a foreign substance in the form of a mucus plug. No absolute rule can be formulated concerning the philosophy of the physiology of

conception, other than the fixation of the uterine body in the centre of the pelvic axes, an erectile straightening of its cervical and corporeal axes, an opening of the cervical canal and external os, and the ejaculation of the semen into the uterine cavity. When the erection of the uterus subsides, the germinating fluid is imprisoned in the cavity of the body, and then retained. Hence the folly of many women who syringe themselves, immediately after coition, with cold water to prevent conception, unless the shock of the fluid begets some sudden contractile uterine action which expels the contained semen—a very rare occurrence indeed. The explanation why women who use cold water after coition so seldom conceive, is not in the washings they give themselves, but from the fact that such an unnatural procedure had long since rendered them sterile, by developing cervical catarrh in consequence of their having so frequently shocked the distended and engorged organs, thereby producing repeated blood stasis and temporary congestions.

With these ideas concerning the fecundation of the ovule, it is quite proper to consider the causes of sterility. The patient now before us and whose infecundity we have to explain on account of lateral retroversion of the uterus, very naturally desires an opinion as to the probability of her bearing a child. There is certainly a capacity for procreation, if the germinal fluid could but reach the uterine cavity in a normal condition, but at present there are anatomical and pathological obstructions to such a consummation ; first, in the malposition which prevents normal fixation in the central vaginal axis, because of the shortening of the left broad ligament, ; and second, the character of the uterine discharges are too acrid and viscid. If the spermatozoa could even enter they would be changed by chemical metamorphosis, but they do not enter because of the mucosities of the cervical canal, as well as the absence of the parallelism of fixation from latero-retroversion.

Sterility is perhaps as little understood by patients presenting themselves for advice, as is any question they can propound the medical man. To properly understand the subject we should study it in all of its bearings. What then is sterility? It is a failure upon the part of the ovule to be amalgamated with the spermatozoa to produce the embryo. It is caused by defective physical and physiological conditions, and differs from barrenness in the fact that a sterile woman may be made to conceive, whilst the barren woman cannot under any circumstances be impregnated. A woman may be sterile from many causes, accidental in nature, as well as incidental to changes engendered by puberty or disease, and she may be made to conceive when art interferes, by removing the cause. When there are irremovable causes, such as undeveloped uterus, inoperable atresia of the uterine body, impermeable oviducts, lateral hermaphrodisim, the woman is absolutely without hope of offspring, because of the impossibility of seminal engraftment. There are women who are neither sterile or barren, occupying an intermediate place, wherein impregnation may ensue, but delivery at term is never accomplished because the conformation of the uterus is such as to preclude its sufficient growth to accommodate even a seven months' foetus. In these women we find the *one-horned uterus*, or a *double vagina* with *deficient double uterus*, or with a *bi-cornate uterus* well developed, or a single vagina with a well developed cervix uteri and defective uterine body, the *incurviform uterus*. These intermediate examples are very rare, but we occasionally encounter them, and the failure to go to full term, the abortions of the earlier months—can thereby be explained. There are a few cases of double uterus on record, where women went seven months, and were delivered of a living child.

In general, sterility on the part of the woman is mechanical, or mechano-pathological. Any condition of the female

generative organs which presents an obstruction to the entrance of the seminal fluid to the uterine body, such as flexions, versions, the presence of a tumor, lacerations, and displacements, may be strictly termed mechanical. When the uterus and the vagina occupy their normal relationship, and the uterine and cervical cavities are the sites of catarrhal, ulcerative or polypoidic changes, or the external os is too small in consequence of cervical connective tissue change, the sterility may be called mechano-pathological, because the germinating fluid either does not penetrate the external os or the cervical canal, and if it do, it reaches the uterine cavity chemically changed and divested of its inherent power to unite with the ovule and undergo those hyperplastic changes necessary to conception.

Other conditions than uterine or ovarian may be found in the external genitalia or in the vagina, such as thickened hymen, partial atresia of the vagina, vaginismus, excessive obliquity or deformity of the pelvis rendering coition impracticable. A very frequent cause of sterility is in excessive venery producing a constant nerve stimulation of the generative circle, a constant congestion of the entire organism, which very decidedly interferes with normal and regular functioning. These cases are not infrequent in young married females, who, failing to become impregnated during the earlier months of connubial life, are either taken to task by the husband or taunted by some more fortunate female friend, and as a consequence they repeatedly urge the act in the blended hope of offspring and the fear of losing the respect and affection of their husbands. The result soon tells upon them both constitutionally and sexually, and sterility is engrafted upon a deteriorated physique, seriously complicating the treatment and prognosis. The age of a woman is a matter of serious importance when the question of sterility is taken into consideration,

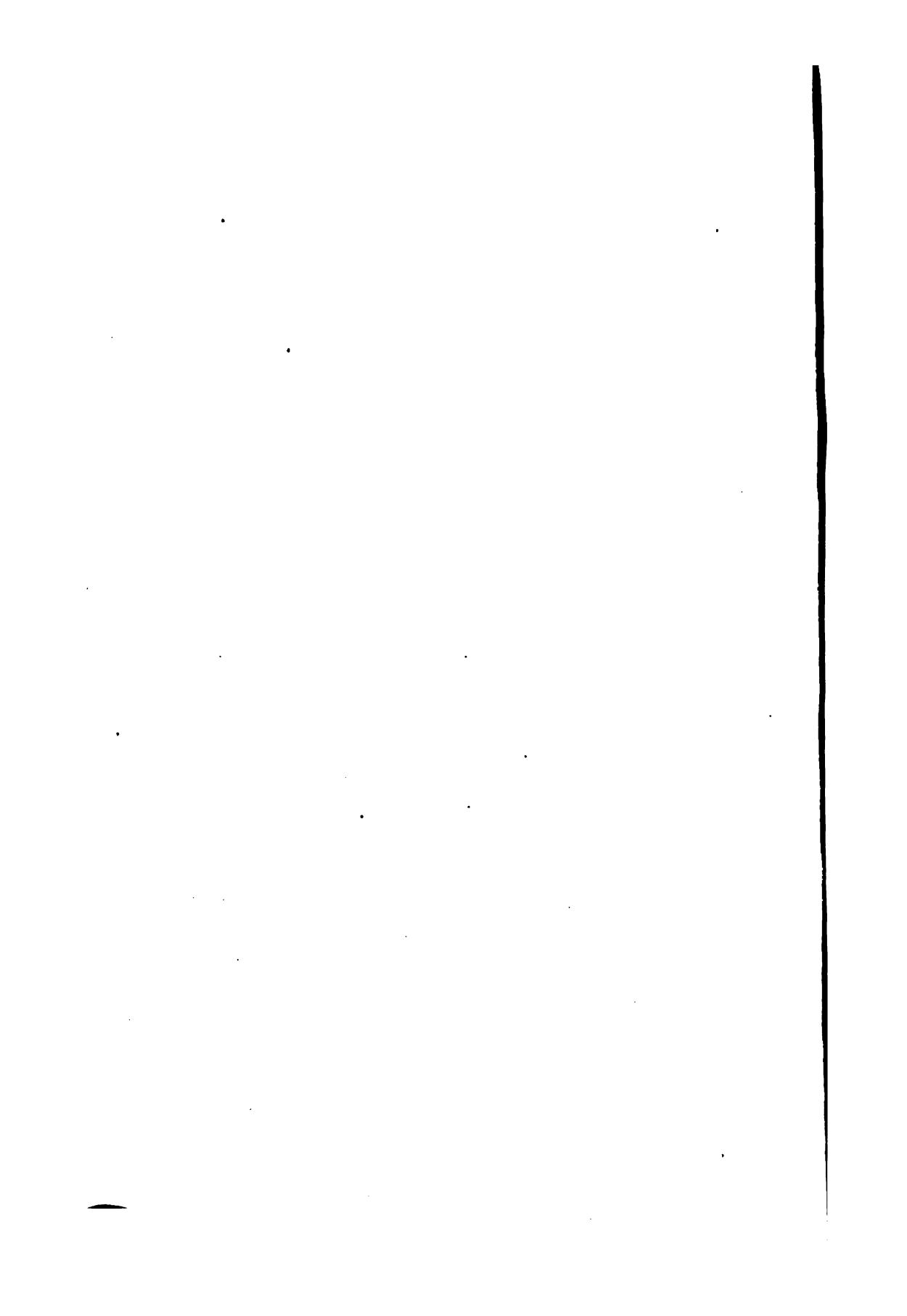
not only as a matter of physiological interest, but frequently as a matter of domestic quietude ; and, not infrequently you may be called upon to testify as experts in questions of medico-legal interest wherein legitimacy, inheritance, or the fair fame of a woman is involved. The point of age is one of extreme interest, and the medico-legal expert must be reinforced by every physiological, anatomical, pathological and historical fact that can possibly enlighten the jury. Maternity has taken place under so many extraordinary and exceptional circumstances, that the abstract fact of sterility as its opposite is of necessity to be considered. The average period of maternity in the civilized world is, generally speaking, from fifteen to forty-eight, yet we are told that Cornelia, the mother of the Scipios, gave birth to a son when she was sixty years of age—that Marsa, a Venetian physician, thought another woman, also sixty years of age, to have a dropsy, who was pregnant and bore a child. Delamotte relates that a maid of fifty-one put off marriage for fear of becoming a mother, yet when she did marry at that age, conceived and bore a child. Capuron relates that a woman living in Paris bore a child when she was sixty-three. On the other hand, there are quite a number of cases of girls having borne children before they were twelve years old. Hence you see the question of age with regard to sterility is a matter of extreme importance. Therefore, we must study this question with great care, and satisfy ourselves that the woman herself is sterile, and not commit the error of treating a wife for such a state, when the impossibility of procreation lay with the husband. I have known of more than one illustration of such a mistake, where a woman was treated for a long time,—in one instance for nearly three years,—when a second medical man was called in and suggested that the husband's sexual capacity be examined, which was found to be absolutely negative. The experiments of Duplay, Casper and

Sims reveal some very curious facts with regard to the presence of spermatozoa in the semen. It was found that the seminal emission does not always contain spermatozoa, but that in the same individual they were often variable in numbers, size and quality, sometimes even absent. In one of Casper's cases, that of a baker's apprentice, twenty years old, with a powerful development of body, who had hanged himself, there were found *very few* spermatozoa in the seminal vesicles, whilst in another man, ninety-six years of age, who died in hospital, a *number* of spermatozoa were found. A woman then, who would have been married to the baker's apprentice might have remained sterile, but with the old man of ninety-six might have borne children.

Sterility in the woman is caused by an incapacity for insemination, either from faulty position of the copulative or germinating organs, or from a diseased or non-developed condition of the same. That it can be cured in many instances there is no doubt, but that we can formulate any given rule for its treatment is out of the question, beyond the fact that in a healthy woman, whose organs of generation are symmetrically arranged, who menstruates regularly and comparatively free from pain, and who is the recipient of healthy insemination, we may expect conception to ensue. If impregnation do not take place under these circumstances, there are some bars to maternity which we have not discovered and which evidently can be located in a defective ovipont, a strictured or diseased oviduct, a diseased uterine lining membrane, a narrowing or bending of the cervical canal or some faulty implantation of the vagina, either at its cervical termination or in its lumen, or at the vulvar orifice. Most generally, sterile women suffer from dysmenorrhœa or menorrhagia, but all dysmenorrhœic women are not sterile.

25] MENSTRUATION, CONCEPTION, AND STERILITY. 75

The treatment of sterility depends upon its cause, and as individual cases present themselves I shall more fully enter into the therapeutics, most frequently surgical, required to overcome it. But you must not think it an easy task. Like most cases to be treated by the gynæcologist, they are hedged in by all manner of difficulties and vexatious disappointments. Occasionally, however, we get some brilliant results, but oftener we must confess to ignominious failures, and have to console ourselves as did Ambroise Paré, whose motto was "Moi, je coupe, Dieu le panse."



## CONVERGENT STRABISMUS

BY

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In this lecture we shall not attempt an exhaustive treatment of the subject of Strabismus, but simple endeavor to point out as plainly and practically as possible the more important features of the variety known as convergent, dwelling especially upon the methods of examination and treatment which, from our own experience, we believe to be of the most importance. Strictly speaking strabismus is not an independent morbid condition, but a symptom depending upon various abnormal states, the form we are studying being usually due to an error of the refraction of the eye. In most of the text books, however, it is treated of as a disease rather than a symptom, and for the sake of convenience we will not depart from this usage.

Strabismus or squint is a deviation of the visual lines, which occurs only when both eyes are used, (binocular vision), for when one eye is covered the other can be made to move freely in all directions. (Stellwag.) Formerly the term was applied to all abnormal deviation of the visual lines from whatever cause produced, whether from spasm or paralysis of one or more of the ocular muscles, or from some tumor or other morbid process in the orbit preventing the free movements of the eyes in certain directions.

In our consideration of the subject we shall consider only

bismus, in which the secondary deviation is always much larger than the primary. This rule is invariable and must always be kept in mind. The extent of movement in the two eyes is exactly normal and equal, only the arc of mobility is shifted inwards towards the shortened muscle, but what is gained in this direction is lost in the movement outwards. The increase in mobility, however, is very insignificant when compared to the degree of squint.

It is on account of this complete accompaniment of the squinting eye with the movements of the healthy one that it has been called concomitant strabismus. If an object held in the horizontal median plane be moved from right to left, the visual axis of the squinting eye will exactly accompany the movements of the healthy one. The lateral movements of the eye adduction and abduction, are measured by the relations of the pupil to the lachrymal punctum of the lower lid and the outer commissure. This is conveniently expressed in a diagrammatic way by Bowman. He notes the extreme range inwards by marking the position of the pupil on extreme inversion, compared to the punctum and the extreme range outwards by marking the position of the cornea on extreme eversion, compared to the external canthus. It is of great importance to measure accurately the mobility of the eye,—no operation should be undertaken without it.

In taking the relation of the pupil to the punctum the observer should stand so as to face it in its inverted position otherwise the distance between it and the punctum is not so correctly ascertained. If in the measurement of eversion the corneal margin passes beyond the canthus the position can be marked by estimating how much of the iris is hidden. An exact diagrammatic measure of this kind should always be kept in order that we may be able to calculate the effect of an operation upon the mobility of the eyes.

Concomitant squint may be apparent, periodic, monolateral, or alternating. We must now consider these different forms. In apparent convergence there is an undoubted deviation of the optical axes, and yet both eyes are steadily fixed upon the object and neither deviates when the other is covered. Hence the squint is not real but only apparent. Donders, who first mentioned this fact, gives the following explanation : according to Helmholtz the optical axes and the visual lines do not correspond. The latter strikes the cornea slightly to the inner side of the optic axis, forming with it an angle of about  $5^{\circ}$ . It will therefore be apparent that if the visual lines are parallel the optic axes must be slightly divergent, this is the case in the normal eye, but the divergence is so slight as to escape our notice. In some cases (so called incongruence of the retina) the relation of the visual line may change its position so as to give rise to an apparent strabismus. If for instance the visual line instead of lying to the inner side of the optic axis corresponds to or even lies to its outer side, there will be an apparent convergent strabismus ; for while the visual lines meet at the object of fixation, the optic axes must necessarily cross on this side of it. This apparent squint is seen in myopic eyes.—(Donders Accom., and Refraction of the Eye ; Sydenham Translation.)

Periodic strabismus only shows itself intermittently, when the patient is accommodating, looking at near objects, as soon as the eye regards distant objects, it again disappears,—more will be said of this form of squint which is usually but the beginning of constant strabismus, in speaking of its etiology. In one sided squint (monolateral) the squint is always confined to one and the same eye when both eyes are open. If we cover the healthy eye the squinting one will at once move outwards to fix the object, but so soon as we remove the hand the squint will return.

In alternating squint, on the contrary, sometimes one eye deviates and sometimes the other. If in this case we cover one eye, the other will move out to fix the object, moreover it will retain this position when we uncover the other. If we then cover the other the squint will alternate again. In fact it seems a matter of indifference to the patient with which eye he squints. In some cases, however, while the squint alternates, there is a preference for fixing with one eye and the other generally deviates. Such cases soon become no doubt monolateral. In alternating squint there is generally no loss of the acuteness of vision in either eye, whereas, in monolateral squint there almost always is and sometimes to a very considerable degree in the squinting one.

The amblyopia of the squinting eye is caused by the suppression of the double images, which always exist, and is finally accomplished by disregarding altogether that received on the affected eye,—that is to say, the power of binocular vision is lost and the patient only regards the image which is formed on the healthy side.

It was at one time proposed to cure strabismus by closing the healthy eye and causing the patient to look with the affected one. The error of such a plan of treatment must, however, upon the least reflection appear self evident, as the squint is only transferred to the excluded eye; for just the same thing happens as when we cover the healthy eye with the hand, in order to estimate the secondary and primary deviation. We exercise the vision of the squinting eye, but the disease is not cured. A resort to this method may be of use, however, in changing a monolateral squint to an alternating one and preventing the loss of sight which occurs in the squinting eye. If we have a patient with one sided strabismus only and for some reason have to defer the operation, we may preserve the sight in both eyes by the periodical exclusion of the squinting one.

The presence or absence of binocular vision is of great importance in the prognosis, and therefore it should always be a part of the routine examination to decide this point before operating. Its presence will of course be inferred if there be binocular double vision. This easily can be determined by the use of prisms.

Before making this test, however, each eye should be examined separately as to its acuity of vision, range of accommodation, and state of refraction which should be carefully noted, and always recorded in the case book. It must also be noted whether the visual lines fixes an object or whether the eyes fixes the latter with some other portion of the retina than the yellow spot. In the former case it is termed central, in the latter, eccentric fixation.

The patient is then directed to look at the flame of a candle held at 4 or 5 feet from the eye, and a prism with its base upwards placed before one eye, let us say the right, and a colored glass before the other. If two images now appear one above the other, that of the right below, and the colored one above, the relative position of the images are homonymous, so that when the right eye is covered the right false image disappears, and when the left is covered the left disappears. Vertical diplopia is present because a fusion of the double images is impossible, and binocular vision is present. If on the other hand the prism have no such effect in producing diplopia and only one image be present, it proves that binocular vision is absent.

Binocular diplopia occurs spontaneously only exceptional during the development of convergent squint. The patient notices a certain shifting during the deviation, and immediately afterwards a separation of the images. This appearance, moreover, is generally but transitory, and often difficult to demonstrate on account of the tender age of the patients, in which convergent strabismus usually commences.

When once the strabismus is fully declared, even in the periodical form, spontaneous diplopia does not occur and artificial measures must be resorted to in order to demonstrate its presence. Sometimes it is sufficient to cause the patient to regard alternately an object held in the direction of the deviating line of vision, in order to cause the pseudo-image of the object of fixation to be perceived. Generally a colored glass must be put before one eye (the fixing one) in order that the double images may be demonstrated. These manœuvres, however, according to Alfred Graefe, succeed only in a certain class of cases where a constant monocular strabismus has existed for a long time, especially where the energy of the central parts of the deviating retina have become blunted, without however having become incapable of perceiving some impressions. When the energy of the central zones of the retina have remained almost normal, double images in a constant monolateral squint cannot be produced, and we succeed still less in the periodic and alternating forms.

Squinting persons usually carry their heads to one side. This must be borne in mind in testing the situation and relation of the double images, and before examining, the faulty position of the head must be controlled, *i. e.*, the patient made to look straight forward.

Diplopia often becomes apparent after tenotomy of the squinting muscle, even when it cannot be provoked by any means of examination ; of this we shall say more when speaking of the operation of tenotomy. Binocular vision is lost only in parts of the retina, more especially in those in which, though not identical with, are constantly excited with the central portion of the retina of the other eye. Thus, in convergent squint the part of the retina which lies internal to the macula-lutea is the first to suffer loss of binocular vision, for it is directed towards the object, and is therefore, although not identical with

it, constantly excited simultaneously with the central portion of the retina of the other eye, which is fixed upon the object. It is the negation of the image produced upon this portion of the retina, to avoid the diplopia which would otherwise ensue, that renders it deficient in sight. At first it is only the horizontal portion of the retina which suffers, as is proven by the diplopia which ensues when we place a prism with its base upwards before the eye, so as to deflect the image upon some other portion of the retina, we obtain diplopia with not only a difference in height but a lateral separation as well. Sometimes the anaesthesia extends all over the retina, and then we fail by any means to obtain diplopia. Again, it may be confined to small circumscribed portions which can be mapped out with the greatest nicety. In regard to the frequency of binocular vision in squint, Graefe has found that it is absent in about 90 per cent. of cases of concomitant squint; that we can produce diplopia by prisms in about 25 per cent.; and that after the operation binocular vision exists in about 25 per cent.

Without having kept any statistics on this point myself, I am inclined to think that the percentage of cases in which binocular vision exists after carefully performed tenotomy of the tendon, should be put at a larger percentage than this.

The diplopia causes the patient so much confusion and annoyance that very soon he mentally suppresses the pseudo-image of the squinting eye. As a result the suppressed portions soon lose their acuteness of perception, become amblyopic, and the latter very rapidly ensues, especially in children, so that even in a few months the squinting eye becomes unable to read even large letters.

We are often asked whether the child of a few years old should be operated on at once or the operation deferred until it grows older. My advice in all such cases is to operate at once, while vision in the squinting eye is still good and

binocular vision exists, or at all events there is a better prospect of restoring it by an operation. If for some reason, however, it is absolutely necessary to put it off, the rule for practising the vision of the squinting already mentioned should be employed.

We must now pass on to consider the causes of convergent strabismus, which is, correctly speaking, not a disease but only a symptom. In the vast majority of cases it is due to an error of refraction, namely, hypermetropia. Donders says this state of refraction exists in 75 per cent. of cases of convergent squint, and Wecker places it even higher, at 85 per cent. Let us see what hypermetropia is and how it produces convergent strabismus. And in doing so we shall mainly give the explanation of Donders. The error of refraction may often be overlooked, especially in those young subjects who are so often afflicted with squint; it may be latent, or overlooked because the patient does not know how to read, and therefore cannot be tested in the usual way. Fortunately, however, we possess a means in the ophthalmoscope of accurately determining the state of refraction quite independently of the answers of the patient. And this method of examination should in all such cases be resorted to.

We have now to consider how it is that hypermetropia produces convergent squint, and let us attempt to do this in as simple a manner as possible. By hypermetropia we understand that the state of refraction of the eye is too low, or the optic axis (antero-posterior diameter) is too short; rays of light, therefore, which emanate from distant objects and impinge upon the retina parallel are not brought to a focus upon the retina, but when the eye is at rest, as in a normal eye, but more or less behind according to the amount of hypermetropia which is present. The effect of this low state of the refraction is to cause an effort of accommodation (change in curvature of the

crystalline lens), even when the eye is adjusted for distances in which the normal eye is at rest. The amount of accommodation put forth must necessarily be increased in amount when the object is brought closer to the eye, for if accommodative effort be required to unite parallel rays upon the retina, how much more will this be the case when the rays impinging on the eye are divergent, as is the case in looking at near objects. Vision of near objects, therefore, requires excessive tension of accommodation.

We know that there exists an intimate relation between this act and that of convergence of the visual lines. The greater the accommodation the greater the convergence. It is manifest, therefore, that soon as such a patient desires to put his accommodation upon the stretch, an increased amount of convergence becomes necessary. A person with a normal (emmetropic) eye can convince himself of the truth of this assertion by placing a concave glass before his eyes, and thus bringing them temporarily into the condition of hypermetropia. He will soon find that on the endeavor to see, distinctly double images threaten to appear as the result of increased convergence, and that soon there is no other choice left between distinct vision and squint. This is probably the only alternative left to many hypermetropes.

A practical remark may here be introduced of the danger of giving near-sighted persons too strong concave glasses for reading, for we may thus produce a convergent strabismus.

One eye deviates inwards then in order by the increased convergence, to produce an increase in accommodation. At first this deviation is only periodic, occurring when the patient is looking intently at near objects, and disappearing when the eye is directed to a distance. This form of squint, as we have said in defining the different forms, is called periodic, and hypermetropia is the most common cause of it. Donders says that

this error of refraction is very widely spread, and every oculist knows how true is this assertion. It is therefore a matter of surprise that convergent strabismus is not even more common than it is among this class of people. This kind of squint is usually first noticed in children at about the age of four or five years, when they first begin to use their eyes in learning their letters. One eye will then deviate inwards, but the deviation will again disappear as soon as the attention is removed from the object. Sometimes, too, the squint will appear whenever the eyes are directed intently at an object, whether it be close by, or at a distance.

The squint may be corrected by suitable convex glasses put before the eyes, but returns again when they are removed, and if they are left off altogether it soon becomes constant and acquires all the characteristics of concomitant strabismus. A common impression among the people, which has also gained a good deal of credence with the profession, is that squint may be caused by imitation, especially as it often occurs in different members of the same family. Hypermetropia, as is well known, is very often hereditary, and it is far more likely that a common cause has excited the trouble in the imitator and imitated. I have often enough examined several cases of strabismus occurring in the same family, and found them all to be hypermetropic. I do not therefore believe that this common impression has any more foundation in fact, than have so many others which are so frequently assigned by the parents of the child as the cause of the strabismus. Nearly every one who brings me a child with squint has some cause or another to offer for the deviation in vision.

Donders offers as an explanation why a larger proportion of hypermetropic persons do not squint, that they prefer to sacrifice a certain amount of distinctness and acuteness of vision rather than to suffer from diplopia. For this reason; if we

cover one eye of a hypermetropic person the other will squint inwards when used for regarding a near object. But it is otherwise when the distinctness of vision is different in the images of the two eyes, as, for instance, when the amount of hyperopia is greater in one eye than in the other, or if there be some opacity in the refractive media of one eye. In such cases a convergent squint is readily developed; the same occurs if the internal recti are unusually strong. Convergent squint is most commonly met with in the lower degrees of hypermetropia (one-thirtieth to one-tenth), being generally absent in the higher degrees. It should be mentioned, however, that the amount of hypermetropia which can be detected by the ophthalmoscope often considerably exceeds that found by the examination with glasses. This is to be explained by assuming that in the higher degrees of the refractive error it is impossible even with excessive convergence to obtain distinct retinal images, and the patient therefore puts up with imperfect vision rather than to make a maximum effort to improve it.

Impaired vision of one eye from opacity of the cornea or lens, or some affection of the deeper structures of the eye, is a frequent cause of strabismus. In such cases the difference in the clearness and distinctness of the retinal images causes the patient to disregard that formed on the imperfect eye (to squint with it), so as to bring the image upon a less sensitive portion of the retina, and the image of this eye becomes so diminished in intensity as no longer to be of any annoyance.

The direction of the deviation will correspond to the relatively strongest muscle. Often such eyes deviate strongly outward. The strongest muscles contract more and more, and the squint assumes all the symptoms of a concomitant one. The image of the squinting eye is gradually suppressed, and the eye loses from disuse its sharpness of vision. If in such instances hyperopia co-exist, the tendency to the production of strabismus

is increased by this fact, for the tendency to excessive convergence is increased by the indistinctness of the retinal image caused by the opacity. If in cases of macula-cornea, which are so frequently seen in convergent strabismus, we examine the refraction, we will usually find hypermetropia. Donders, moreover, suggests the probability that in such cases the inflammatory symptoms which first exist in some other part of the eye may extend to the muscle itself, and produce contraction and shortening, which at first is spasmodic but may soon become permanent.

Convergent squint may come on as a secondary affection after paralysis or wounds of the opponent muscle. Marked instances of this are seen after some operations for strabismus, in which the extent of the operation was too large for the requirements of the case, or the muscle itself instead of the tendon have been divided. We exclude here as a matter of course those cases in which the squint is caused by a paralysis of the external muscle, and where the diagnosis of paralysis should be made and treated, many cases entirely recover without leaving any trace of squint, but, on the other hand, the opposing muscle may by a secondary contraction give rise to permanent strabismus.

Von Graefe has shown that in rare cases myopia occasions convergent strabismus,—the reverse is the rule, divergent strabismus being as generally cause by it as convergent squint is by hypermetropia. It occurs only in those cases where the myopia is of moderate degree and the eyes are much employed for near vision.

After a time the internal recti muscles become contracted from the excessive strain put upon them and cannot be relaxed when the patient looks at a distance, the external muscles being too weak to overcome the action of the internal ones. In this manner a convergent squint is produced which at first is peri-

odic but soon becomes permanent and appears as soon as the patient looks at an object which is not close to him.

This form of squint is not met with in the higher grades of myopia, because in these the necessary convergence of the visual lines cannot be maintained on account of the close proximity of the object, and therefore the patient usually employs only one eye and the other goes outward giving rise to a divergent strabismus. It is often the case that strabismus is developed in children after severe constitutional diseases, such as diphtheria, which diminish the range of accommodation even though merely temporarily (Alt).

According to Graefe sooner or later changes occur in the squinting muscle itself, as well as in the associate muscle of the other eye. At first only the squinting muscle itself is affected. Its excessive action leads to hyperæmia and capillary hemorrhages in its tissue, or even to actual inflammation which finally cause different changes, but most frequently tendinous degeneration, with shrinkage. But more frequently, and even as a rule, the muscle suffers from over-nutrition ; it hypertrophies, increases in thickness and breadth, and thus actually attains an excess in power over its partner, which becomes gradually distended, elongated, but at the same time loses in thickness and breath and finally even atrophies. This same thing at last happens to the hypertrophied squinting muscle. This gradually degenerates and shrinks to a small, rigid and bloodless tendinous string, that is of course, entirely incapable of muscular contraction, and which by means of its gradual shortening at times occasionally brings about degrees of deviation which were previously impossible under the maximum exertion of its strength. At last the partner of the squinting muscle in the other eye takes on similar degenerative change, becomes hypertrophied, and subsequently like its distended antagonist, becomes atrophied. The mobility of the

fixing eye therefore becomes impaired, and the patient is compelled to bring the eye into proper relation to the object by changing the position of his head. In this relation it may be remarked, that the broad tendinous insertions sometimes seen may correspond to the hypertrophied change in the muscle, and the more advanced stage a small muscle is found.

We now come to the most important part of our subject, the treatment of strabismus, which we shall divide into the prophylactic—which aims to prevent the development and organization of squint, and the curative, by which we aim to restore binocular vision by removing an already existing squint, and when this is impossible, to diminish the angle of the squint to such an extent that the amount of disfigurement of the patient may be very slight.

At the outset it should be said that we but rarely have the opportunity offered us for the prophylactic treatment, because we are not consulted in time, before the squint is already declared. This plan of treatment it will be obvious from what has gone before must depend upon the cause, and must be adopted early in order to be successful; as a rule in early childhood. Where the conditions necessitate greater amounts of accommodation to be suspected or admits of their demonstration, the preventive treatment aimed, at should be to avoid any effort at prolonged straining to secure clear and distinct vision, especially at short distances, in order by this means to avoid as far as possible the causes for squint. In such cases the choice of playthings should be selected in such a way as not to entice the child to look intently at them, and the acquiring of knowledge, reading, writing, and other occupations requiring strain of the accommodation should be deferred until a later period than would otherwise be the custom.

As the child gets older the kind and degree of the pathogenetic factors is more readily determined, and thus the proper

means for lessening or removing the obstacles to binocular vision. Especially is this the case where hypermetropia threatens to give rise to squint, in which case a partial or total neutralization of the error of refraction by the appropriate convex glass is urgently called for.

If the squint has already become periodic in character we have to make still more strenuous endeavors to prevent the patient from the incentive to squint. It follows therefore that our endeavors must be directed with redoubled energy to the consistent performance of the means of prevention. I must admit that I have but little faith in the efforts to cure periodic strabismus, by such means as these, but still there can be no doubt that sometimes we do obtain a cure.

In small children, where glasses cannot be employed, there is but little to do but to obviate the tendency to such amusements as produce excessive degrees of convergence. When the child grows older and the necessity for the commencement of study cannot be further delayed we must then proceed to the correction of the hypermetropia, so far as it is concerned in the production of the squint. But if the mobility of the eye inwards be excessive, I think the better plan is to make a careful tenotomy of the strongest muscle and give the glasses afterwards. With regard to the glass to be given this is not so much determined by the amount of the error of refraction as by the amount of accommodation which is associated with the squint. Weaker glasses than the actual amount of the hypermetropia will often suffice, since the tendency to squint, especially in the beginning, occurs only in increased amounts of accommodation. In other cases stronger glasses will be required. The choice of glasses must be determined in each case by actual experiment. In general we shall succeed best by neutralizing the manifest hypermetropia,—by which we mean giving the strongest convex glass with which the patient can

see distinctly at a distance. If this, however, be insufficient to overcome the tendency to squint we employ a stronger one, and it is well to select the weakest one which is able to restrain the squint under given circumstances.

In periodic squint the glass will only be needed for near objects. If the squint, however, has become permanent we must cause them to be worn all the while; or so long as the patient is not employed in working at near objects, reading, writing, etc., weaker ones may be worn for the distance, and the stronger ones should be worn only when working. In some cases the simple correction of the state of refraction to the normal, or the reduction of the amount of the accommodation for certain distances to the normal proves insufficient, and over-correcting glasses gives rise to asthenopia. In such cases we sometimes gain something by beginning with weaker glasses and gradually increasing their strength to the desired amount.

We shall not longer delay to treat more minutely of the use of glasses, because we have but little faith in the success to be obtained by this plan of treatment. That occasional cases of periodic squint may be cured by the timely use of glasses we do not doubt, but their employment is rarely carried out as it should be, and in young subjects it is often almost impracticable. In periodic strabismus, even, we prefer to make tenotomy and employ glasses afterwards. Still less faith do we have in the so-called orthopædic treatment of squint. This consists in presenting a second object to the deviating eye, and approximating it more and more to the point of fixation of the healthy one in order to blend the double images. Such exercises are performed by approximating the double images by the use of prisms so that they can be more readily united. Javal, of Paris, has introduced a stereoscopic arrangement for such orthopædic exercises, which consists in the fusion of two large dots (one in each half of the instrument), and subsequently of letters and

words gradually diminishing in size. But both of these means of exercising demand great patience and nicety, and most patients themselves will greatly prefer the more speedy cure by operation. We do not, therefore, employ them and if they have any value at all it is in perfecting the result of an operation. The employment of so-called squint glasses, that is, covering both eyes by centrally perforated diaphragm "nut shells" is of no use; on the contrary they increase the difficulty of the binocular visual act, and thus cause the squint to become permanent.

Such measures are the resort of those who dread operative procedures—a fear of which we do not partake—for when properly performed with due regard to the objects to be attained, strabotomy is in our judgment one of the most successful of all surgical procedures. Absolute concomitant squint can only be cured by an operation. Let us now proceed to consider carefully what are the objects to be obtained by an operation and how it should be performed:

The older operations for the cure of strabismus, in which the belly of the muscle itself instead of the insertion of the tendon were divided, through large openings in the conjunctiva and excessive dissection of the sub-conjunctival tissue and Tenon's capsule, gave rise to such deformities from excessive sinking of the caruncle, imobility of the eye inwards and extreme divergent strabismus, that the operation deservedly fell into disrepute. Since Graefe has laid down carefully the indications for its performance and introduced more exact methods of operating, the whole subject has been put upon a different basis. We now know that success depends less upon manual dexterity (although this is not to be despised) than upon a thorough knowledge of the theoretical part of the subject.

The object of the operation is to weaken the muscle so that its influence upon the movements and position of the eyeball may be diminished. This is to be effected by carefully divid-

ing the tendon as close to its insertion as possible ; the muscle will then recede slightly and take its insertion somewhat farther back. This displacing of the muscle must necessarily weaken its action, for the farther back its insertion the less power can it exert in the movements of the eyeball inwards. We should aim, therefore, to weaken the action of the muscle without reducing its mobility beyond the normal range. To do this each case must be subjected to careful examination, and the operation carefully adapted to the amount and nature of its requirements. We shall see as we proceed how this may be done almost to a nicety. The ability to do this, which is called by some writers "dosing" the operation, is what constitutes a good squint operator. The mobility of the eye should never be reduced beyond the normal, which permits the inner margin of the pupil reaching the lachrymal point. After the division and retrocession of the muscle, the eyeball will incline passively to the side of the opponent muscle to about the same extent as the muscle has receded on the sclerotic. The diminution of the movement of the eye inwards will, however, exceed the extent of this retrocession. If the muscles have receded two lines, the loss of mobility will be from two to three lines, and this would impair the result of the operation considerably (especially in the act of accommodation), if it were not for the fact that the mobility of the squinting muscle is pathologically increased towards the shortened muscle. Hence the mobility will be in reality but little diminished by the operation, and it never should be reduced beyond the normal amount. We have already said that the earlier a case of strabismus is operated on the better. Whether one or both eyes are to be operated upon does not depend upon whether both eyes squint or not, but solely on the extent of the convergence. It is quite erroneous to confine the operation to one eye when the squint is monolateral, and to operate only upon both when it is alternating.

If the amount of squint exceeds  $2\frac{1}{2}''$  or  $3''$  both eyes should be operated upon. A squint of this amount can usually be cured by one operation by incising the conjunctiva somewhat more freely, but if it exceed this amount we must always divide the operation between the two eyes. It is always better to operate upon both eyes than to reduce the mobility too much in one. Both eyes should never be operated upon at a sitting. It is better to wait until the permanent result obtained by the first tenotomy can be estimated before the operation upon the other is done. This is contrary to the practice of some excellent operators, but it is a rule from which I never swerve. In alternating squint the eye in which the mobility inwards is the greatest is to be operated upon first.

We will now proceed to a description of the operation. I always prefer, when it is possible, to operate without an anæsthetic, because the examination of the effect produced by the tenotomy is thereby facilitated, but of course it will be necessary in operating upon children to employ one, and Alt suggests nitrous oxide as the best, because of the rapidity with which the patient recovers from its effect, and the result of the operation can be sooner examined.

I shall only describe the method of operating which I habitually employ myself—which is a modification of von Graefe's sub-conjunctival operation as recommended by Wells, and consists in a very careful division of the tendon as close to its insertion as possible; with the smallest amount of injury to the sub-conjunctival tissue and the tendinous processes of Tenon's capsule.

Before we proceed to a description of the operation it will be well to describe briefly the arrangement of Tenon's capsule, because of its important relation to the tendinous insertion of the muscle. This capsular sheath starts from the optic foramen, surrounds the optic nerve, and then widens out into a cup-shaped

cavity for the reception of the globe of the eye, in which it revolves. It envelopes this beyond the equator, and is only united to the sclerotic by loose connective tissue. Anterior to the equator it is perforated by the muscles, which pass directly through it to be inserted into the sclerotic. At the site of perforation the capsule gives off reflections, which are connected not only with the connective tissue sheath, but also extend backwards toward the origin of the muscle, and also forward towards the insertion where the capsule becomes blended with the conjunctiva. We are now to consider the method of operating. Of course to see the operation performed, as you all will have opportunity is worth more than all descriptions, but we will state as plainly as possible the steps of the operation and the rules to be observed in its performance.

The operator takes his position behind, or somewhat on the side to be operated upon. The other eye is then to be covered, in order that the patient may the better control the movements of the one to be operated upon. The eyelids are to be kept open by a spring speculum, and one which opens the lids widely is to be preferred. If the patient is not under the influence of an anaesthetic, he is directed to look outwards. If he is, then the eye should be drawn outwards by an assistant, with a pair of forceps, who must be careful not to rotate the eyeball on its axis, otherwise the position of the internal rectus may be changed. The operator then seizes a small but deep fold of the conjunctiva close to the corneal margin, the forceps should include in its bite not only the conjunctiva, but the underlying tissue. In order to accomplish this it is a good plan to press the forceps while closed somewhat firmly upon the sclerotic, and then allow the branches to separate slightly and close them again. The conjunctiva is snipped by a pair of small scissors curved on the flat, in a horizontal direction, the opening should correspond, to the lower edge of the muscle and describe a

tangent with the lower margin of the cornea. Some operators recommend that the blades of the scissors should be blunt, in order to avoid puncturing the sclerotic, but this precaution is unnecessary except for very bungling operators. I prefer scissors which have the rivet onto one side, because they admit of a closer approximation of the blades, and the rivet in this position affords a convenient place on which to rest the index finger in cutting. The scissors should be directed vertically in making the incision so as incise all the tissues held in the forceps, and burrowed beneath the sub-conjunctival tissue so as to make a funnel shaped opening, this is, however, to be done carefully so as not to divide it to freely. If the first incision should not open Tenon's capsule, it will be necessary to seize the sub-conjunctival tissue again with the forceps and divide it—for it is all important to a nice performance of the operator to enter this structure before proceeding further. The conjunctival flap is held apart with the forceps, and the squint hook, which should be bent at right angles and have a slightly bulbous point, is to pass through the opening, its point being directed to the lower edge of the muscle. Its point being kept against the sclerotic, it is to be rotated and carried beneath the tendon as close to its insertion as possible, and the whole expanse of the tendon caught upon it. The point of the hook should not be directed upwards and outwards, but rather upwards and inwards, or it may perforate the fibres of the tendon and consequently only a few of them are caught up. The muscle having been secured in this way, the handle of the instrument is carried inwards across the nose, so as to put the tendon on the stretch. The points of the scissors, but slightly opened, are to be passed one behind the tendon, the other in front, between it and the conjunctiva, and divided by successive strokes of the scissors. The tendon can be completely severed in from two to three strokes and the whole operation

may be accomplished, by an expert operator, in four or five. The less cutting is done the better. After the tendon is cut the conjunctiva should be raised on the point of the hook and a second hook carried behind it, above and below to determine whether any fibres are undivided. If the hook pass quite freely to the corneal margin without encountering any resistance every thing is cut, if it is does not, the fibres preventing it should be divided. This search for undivided fibres should be made several times, for some times the lateral expansions of the fibres are very considerable, and if a single fibre remain undivided it may defeat the success of the whole operation.

The principal difficulty which beginners encounter in the performance of the operation is caused by their failing to open Tenon's capsule. If it is found, on the first introduction of the hook, that it slides up to the edge of the cornea, the sub-conjunctival tissue has not been opened at all, or the hook has passed beneath it and the conjunctiva. I have often seen the operation completed without the tendon having been divided at all, and no effect of course produced in the position of the eye. In such a case we must open the sub-conjunctival tissue again and reintroduce the hook. The opening in the conjunctiva and sub-conjunctival tissues should be small, and the excursion of the hook limited, otherwise too great a laceration of tissue will ensue, the retrocession of the muscle will be too great, and the danger of inflammatory reaction will also be enhanced.

The operation is now completed, the speculum is withdrawn, the bleeding controlled by sponging with cold water, and then the effect of the tenotomy upon the accommodative movements and mobility of the eye are to be carefully studied. If the patient has been under the influence of an anaesthetic it will be necessary to wait for its effects to pass off before we proceed with this important part of the examination. By a careful consideration of the behaviour of the operated eye we can

almost certainly predict what will be the ultimate effect of the tenotomy. If after the tendon is divided the eyeball can be directed inwards to the normal extent, that is to say the mobility inwards corresponds to the normal, the desired effect has been procured whether the patient still squints or not, for the correction cannot be safely made at the expense of too great a reduction in the mobility of the eye and the remaining convergence must be cured by an operation on the other eye.

If after the tenotomy the reduction of mobility inwards is too great, *i.e.* the eye cannot be directed inwards to the normal extent, the divided tendon must be prevented from taking its attachment too far backwards on the sclerotic by introducing a suture through the conjunctiva. If the division of the tendon does not decrease the mobility of the eye to the normal, or as is sometimes the case, it remains just the same as it was before the operation. We must examine carefully, with the hook, to ascertain whether a fibre of the tendon has been left undivided. Graefe has pointed out that in some such cases there is an abnormal insertion of the tendon, which in one case he found as far backwards as the equator of the eye. If there be no such cause as this discoverable for the want of effect we must resort to one of the means of increasing the effect of the operation. Having observed the result produced upon the mobility of the eye, which we consider of great importance in determining the question whether to increase or diminish the effect, we next proceed to study the effect which has been produced upon the accommodative movements of the eye. We should try whether both visual lines can be steadily fixed upon the object, when it is brought to a distance of from four to six inches from the eye.

If the eyes are near-sighted, the object must be brought still nearer. We must now closely watch the way the operated eye acts. If it remains stationary when the object is brought up to within

eight inches of the eye, so that a divergence will ensue when it is brought still nearer, we must expect divergence to occur in a few months. But this will be much more the case if the eye instead of remaining stationary makes an associated movement outwards. If such be the case we shall have to diminish the effect of the operation.

Let us now consider the means to be employed to increase or diminish the effect of the operation. The effect of the tenotomy can be increased to some extent by making a freer division of the sub-conjunctival tissue and by enlarging the conjunctival wound, or by the use of a suture. By far the most effectual suture for this purpose is that which was first described by Knapp. After complete tenotomy of the muscle, a deep fold of conjunctiva and episcleral tissue of one or two lines, is picked up close to the outer edge of the cornea. A stout needle armed with strong silk is passed through it, and the needle then carried through the outer commissure from within outwards, and the cornea is made to approach the outer angle of the eye to the desired extent by drawing upon the suture which is then to be tied upon the skin. By this means a fixed position for the eye is obtained, during the time the muscle is forming its new attachment, and the tendon is forced to take an attachment farther back upon the sclerotic, than it would otherwise do, and the effect of the operation is consequently very much increased. We have not found this suture so often applicable in cases of convergent strabismus, because it but seldom happens that we fail to obtain sufficient effect by tenotomy with more or less dissection of the sub-conjunctival tissue. It is principally indicated in large monolateral squints, with reduction of mobility of the eye outwards. The suture should be left in one or two days, and the eye kept bandaged during this time. The method recommended by Graefe to increase the effect of a tenotomy we have never employed. It

consists in seizing a fold of the conjunctiva with the forceps, close to the outer canthus, lifting it off from the episcleral tissue. A curved needle is then passed horizontally through the fold into the sub-conjunctival space and made to glide (the forceps being removed to the upper and inner border of the cornea), beneath the membrane till a portion of this equal to from three to five lines have been included, when the point is again brought out to its place of exit, varying according to the length of its sub-conjunctival passage, its direction being always from the commissure to the upper and inner corneal margin, or it may even be to a point above the vertex of the cornea. The suture is then tightly drawn and tied. By this procedure the eye is said to be rolled outwards to the extent of the enclosed tissue. Graefe said he could by this means obtain any amount of correction in the limitation of the movements of the eye inwards. But the method has not found that favour with other operators which the confidence of this statement would seem to warrant. We always employ Knapp's method when such an object is to be obtained—and see no reason to desire any more effective way of meeting the indication.

The sutures employed to lessen the effect of the operation are passed through the conjunctiva, and the direction through which they are made to pass determines the extent to which this is accomplished. If the effect of the tenotomy has only slightly surpassed the amount which we desired the suture is passed in a vertical direction, so as to simply bring the lips of the conjunctival wound together; this, of course, prevents the divided muscle from retracting as far as it would otherwise do, and the effect of the operation is somewhat diminished. We include more or less conjunctiva within the stitch according to the extent to which we desire to reduce the effect. If we wish still more to decrease the effect, the needle is to be passed obliquely. This will draw the muscle still more forward and the effect is

still more if we include a considerable amount of conjunctiva—or, lastly, if still more reduction is to be accomplished we pass the needle in an horizontal direction, taking up more or less of the conjunctiva, or even the muscle itself according to circumstances. A careful application of these measures, will enable us, in almost every instance, to acquire about the extent of correction needed—but, of course, we shall sometimes be disappointed. With strict attention to these rules, however, divergence will but rarely ensue. In operating on the second eye we must be guided by the same rules laid down for the first operation. But the amount of squint to be corrected is usually much less than in the first instance, the wound in the conjunctiva and sub-conjunctival tissue must be small, and the effect carefully controlled, by the means already described. If double images occur after the first operation, it is to be looked upon as a good omen for it shows a disposition to the restoration of binocular vision.

The after treatment required is simple enough. If no suture has been employed a bandage is not necessary. When Knapp's suture has been introduced both eyes should be bandaged and the patient kept quiet for twenty-four hours. Cold applications should be made if there is much swelling of the lids—usually these are not even necessary. If the operation has been made with proper care there will not be much sinking of the caruncle,—a slight amount, however, will ensue after even carefully performed operations. It is very seldom that serious reaction follows the operation for strabismus, but it sometimes does. There may be simple inflammation of the divided tendon (tendinitis), or the inflammatory process may involve the whole capsule of Tenon. In one case, which I have reported, the eye came very near being lost.—(*Vide, Archives of Ophthalmology and Otology, Vol. iv. p. 410.*)

The symptoms are swelling of the lids, and ocular conjunctiva with serous exudation beneath it—protrusion of the globe and restrictions in its movements. If, however, the tendon only be inflamed the swelling and restriction of mobility will be limited to the inner side. The granulation buttons which sometimes form on the stump of the divided tendon should be snipped off with the scissors. If the opening in the conjunctiva has been made at the lower edge of the tendon, and it has been divided close to its insertion they are not likely to appear. Should divergent squint occur, it is to be remedied either by tenotomy of the externus of one or both eyes, or by advancement of the internus. The sinking of the caruncle and undue prominence of the globe which ensues in some cases, and gives rise to considerable deformity, can be remedied by refreshing the edges of the lids at the inner angle and uniting them with a point or two of suture so as to lessen the size of the palpebral fissure (tarsoraphy.)

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## POINTS IN THE DIAGNOSIS OF HEPATIC AFFECTIONS.

BY

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THE subject which I have chosen for this hour's consideration, is that of the diagnosis of the organic affections of the liver. The frequency with which these diseases are mistaken for one another, as well as for other affections, has led me to this choice. If, in this lecture, I avoid giving you a statistical enumeration of the number of times the symptoms are liable to be present in the different affections, it will be because I feel that this does not help in the study of individual cases.

To arrive at a correct conclusion regarding the nature of diseases of the liver, it is important, that you should make a careful physical exploration of the organ, and that you should study critically the history of the patient's illness, as well as his previous *habits* and diseases, in order to establish the probable etiology. You will find that probable causation is an important aid in diagnosis; and that mistakes are liable to arise by a failure to consider it, and by deceitful statements on the part of patients.

I shall take it for granted that you are acquainted with the normal size and position of the liver. You must however recollect that not every liver which is above or below the

ordinary size is consequently diseased. These deviations when unaccompanied by any indication of disease, may be natural to the individual examined. I cannot avoid mentioning to you the natural position of the gall bladder, as some give it an erroneous position. You will find it under the free border of the ribs, at a point where it is crossed by a line drawn from the point of the shoulder to the symphysis pubis. Only when the right lobe has become considerably enlarged, can the gall bladder occupy a position on a line from the nipple to the umbilicus, which is sometimes given as its natural position.

There are a number of conditions which may lead you to form an erroneous impression as to the size of the liver. Let me mention such as have been brought particularly to my attention, beginning with those which simulate an enlargement of the organ.

a. The transverse colon may be filled with foecal matter. A free purgation before examination, or a re-examination will in all probability do away with or prevent mistake.

b. The right lobe may have a shape more square than usual, and the left lobe be of less than ordinary size.

c. An exudation or transudation in the right pleural sac may depress the liver. In order to avoid this mistake, always examine the condition of the lung. It is a pretty safe rule according to my experience, that both hepatic and splenic enlargements upwards, may be distinguished from liquid in the pleural sac and pulmonary consolidation by percussion. Obtain by percussion the upper limit of dullness in the ordinary state of respiration, at the end of a full expiration, and of a full inspiration; a change in the limits of the dull line upwards and downwards during respiration, is demonstrative of some affection below the diaphragm.

d. An accumulation of serum or of pus between the liver and the diaphragm, is a much more difficult condition to distinguish

from hepatic enlargement on the one hand, and pleural effusion on the other. I have met with two cases illustrative of each of these conditions.

e. An aneurism, or a tumor seated posteriorly to the liver may so press it downwards, that it may seem much enlarged. This cause I have seen lead to a mistaken opinion on the part of some clever diagnosticians. In the case of an aneurism, there is a greater safeguard than in that of a tumor, owing to the existence of pulsation and bruit, ascertainable in most cases by close examination, and of those pains so characteristic of aneurism.

f. A morbid growth of the omentum or of the transverse colon adherent to the border of the liver, may be indistinguishable from a disease of the liver. The symptoms of early implication of the bowel, tympanitic percussion note in the tumor, and gurgling, as matters in some cases pass through the diseased mass, may help to place the disease in the intestine; at least they enabled me to distinguish one case of carcinoma of the transverse colon. Yet, as I have seen two cases in which, on autopsy, I found the liver, bowel and omentum all affected; and was unable to state positively, in one of the cases, in which of these structures the disease began, I feel how difficult the distinction at times is.

g. A cancer or other cause of enlargement of the right kidney, growing as it does below and behind the liver, may give rise to considerable doubt. The ascending colon would run vertically over the renal tumor, and could be discovered there by palpation and percussion. The transverse colon would also in general, be found between the renal and hepatic lines of dullness. The urine in some cases would contain evidences pointing to the kidney as the site of disease. Cancer of the kidney is not so very infrequent in early life. I have met with three cases of it in children under six years of age; on the other

hand, I have not met with primary cancer of the liver in the young ; nor do I recall any primary case younger than the one recorded some time since by Murchison, as occurring in a girl whose age if I remember rightly was twelve years. The failure of the renal tumor to move with respiration, would also help to distinguish it from hepatic.

*a.* An enlarged spleen may be mistaken for an enlarged left lobe. I had under my observation some time since, a man with leucocythaemia of splenic type, who told me that a physician had considered his case as carcinoma of the left lobe of the liver. The mode of growth of splenic enlargements is different from that of hepatic. In the former it is from the left side downwards and towards the median line. The notches in the anterior border of the spleen can be perceived, when it attains any considerable dimensions ; and the flat pancake-like feel which it almost always presents, as well as the right border which is nearly vertical, will also serve to distinguish the spleen from the liver.

These represent some of those conditions which simulate enlargement ; on the other hand, we find certain circumstances, which may cause normal sized or even somewhat enlarged livers to appear smaller than natural.

*a.* Emphysema may cause the right lung to overlap the liver to such an extent, that the region of liver dullness may be much decreased.

*b.* Tympanitic distension of the intestines may so push the liver upwards, that the border, rather than the convex surface, is applied to the anterior region of the chest.

*c.* The transverse colon may pass over instead of under the liver. I have seen several instances of this in the autopsy room. This may take place either over the right or over the left lobe, or over the whole length. The clear tympanitic note obtained higher than usual, is very apt to mislead in any of

these cases. I was led into a curious mistake by one case of this kind several years since. An adult male, who had had chronic dysentery for some time, from which however he had nearly recovered, acquired a hectic type of temperature, and began to fail rapidly without any increase in the bowel trouble ; an examination showed the liver to be of apparently normal size. The lungs gave no indication of disease. Some days later, the liver was found apparently considerably enlarged, leading to a diagnosis of probable abscess of the liver. The autopsy showed miliary tuberculosis, principally affecting the ~~duodenum~~, to be the cause of death. The liver had evidently been enlarged for some time, and between it and the abdominal wall was the transverse colon. An indentation marked the site, where the latter had lain on the lower portion of the liver. Owing to some change of position on the part of this portion of intestine, the liver was found enlarged, and this under the circumstances, (chronic dysentery, hectic type of temperature) led to the supposition of abscess of the liver.

*d.* Ascites, or inflammatory fluids in the peritoneum, renders the examination of the liver difficult, and may, as tympanites so push the liver upwards, that it shall appear unnaturally small. There are two methods to adopt in such cases ; one, to examine the patient while lying on the left side ; the other, when this first method is unsatisfactory, as in large amount of exudation it must be, is to wait until the fluid has been removed by medication or by tapping, before expressing a positive opinion.

*e.* The co-existence of emphysema with ascites, or tympanites, produces at times the greatest possible difficulty in determining the size of the liver ; and I have seen the liver under these circumstances made out to be much smaller than it really was. Where jaundice co-exists, the liability to error is naturally seriously increased.

Let me next say some few words about the method of physical

exploration of the liver. I shall assume that you are familiar with the details, and only speak of the manner which I think important, or of some measure which is not usually adopted.

In percussing, you should use a light stroke for determining the point at which the liver ceases to be covered by lung, and the position of the lower border. But in making out the upper limit of the liver, <sup>pulse</sup> percussion is better. I have always preferred the index, or index and middle finger of my right hand as hammer, and the index of the left hand as pleximeter. In ascertaining the border of the left lobe, you must be especially careful as it is thin, and the stomach is behind it; and if the latter contain either gas or solids, you are liable to map out the former wrongly.

In palpating I have become accustomed to use the palmar surface of the ends of the fingers of the right hand as feelers, and to make pressure on the second phalanges by the tips of the fingers of the left hand. The reason for this is, that better indications can be obtained, than if the right hand be used both for feeling and the necessary pressure. Of course, this method is used where some resistance is to be overcome, and is neither required nor adapted for ordinary palpation, in which one hand is all that is needed. You know that the lower border of the liver on the right side in the mammary region corresponds, or nearly so, to the free border of the ribs. In order to feel it, have the patient lie on the back with the knees drawn up, and the abdominal muscles relaxed. Seat yourself preferably on the right side of the patient, then apply your fingers, as I have advised, just below the free border of the ribs, and ask the patient to make full inspiration and expiration. You will thus, ordinarily, be able to feel the free border of the liver as it ascends and descends, and to ascertain somewhat about the state of its surface near the border. In fat people, and such as have rigid abdominal walls, you will frequently fail in obtaining

any indication of the liver. There is a circumstance which I have seen give rise to erroneous impressions, even on the part of those of considerable experience. It consists in a granular feeling produced by rubbing the skin over the abdominal muscles whilst palpating for the liver. This is supposed to be in the liver when in reality, it is in the subcutaneous fat tissue. When emaciation takes place, what fat remains may be in the form of little lobules ; and with the skin readily moveable, they frequently cause the impression of a granular surface to be conveyed to the examiner. You will find in such cases the same sensation communicated to the fingers by the rest of the abdominal wall. Again I have seen the upper belly of the rectus abdominis muscle mistaken for a tumor of the liver ; a little care will prevent you from making this mistake. Friction fremitus is not infrequently present over the liver in those conditions which give rise to the roughening of the peritoneum covering it. I have obtained it in simple perihepatitis, cirrhosis, carcinoma, and abscess ~~and~~ of the liver peritonitis. In a doubtful case, this as well as the next sign of which I shall speak, is of some value as it points towards a disease, which tends to induce inflammation of the covering of the liver. I frequently auscultate the liver, requiring the patient to breathe deeply in order to ascertain if a friction sound exists. I have not infrequently found it under those conditions, which were mentioned with reference to friction fremitus. It has the same signification. It may also be present in peritonitis, though not usually, owing to deep respirations being avoided in consequence of the pain they give. The position at which you will most frequently obtain these signs is in front, on the right side, in the region of the lower border.

Let me impress upon you also the necessity, especially in doubtful cases, of a careful examination of the other organs of the body, and particularly of those in the abdominal

cavity. As the size of the spleen has a certain amount of diagnostic importance. With reference to diseases of the liver, never omit its examination. A few words of caution, the results of experience, may not be amiss on this point :

*First.* The spleen does not occupy the infra-mammary region in health. *Second.* Its anterior border does not come in front of the vertical middle line of the axilla in health. *Third.* Sometimes in enlarging, it does so for the most part upwards and posteriorly displacing the lower portion of the left lung, and simulating pleurisy or hydrothorax. Mistakes on these points are not infrequent in books.

I have seen the following conditions give rise to the diagnosis of an enlarged spleen,—a full stomach, a full colon in the neighborhood of the spleen, an enlarged left lobe of the liver, enlarged retroperitoneal glands, cancer of the omentum, a left kidney enlarged from disease, effusion in the left pleura. I have also seen much enlarged spleens mistaken for tumor of the uterus, of the ovary, of the omentum, of the left lobe of the liver, and of the kidney. Let me briefly indicate the methods of avoiding these errors. Examine your patient when his stomach is empty; after free purgation if necessary. Examine also the direction of the margin of the enlargement, of its motion with respiration, and of its growth as obtained from the history of the patient. Notice if the colon is over or beneath the tumor.

An examination of diseased livers usually shows, that accompanying the disease there has been an alteration of size. This however is not always true. Frequently in teaching the subject, the diseases are divided into such as produce enlargement or diminished size. This is subject to some inconveniences, and may lead to the idea that a given morbid condition is always associated with a certain change of size. Cirrhosis is a notable exception to such a rule; there are others.

Let me, however, present you a sketch, taking into account as a subdivision the state of the surface, whether smooth or nodular :

Enlarged livers, smooth or apparently smooth.

Condition.	Cause, etc.
a. <i>Hyperplasia.</i>	Simple, leukæmic or pseudo-leukæmic, with or without lymphatic pseudo-plasms, diabetic, syphilitic.
b. <i>Congestion.</i>	Cardiac-pulmonary, of malarial fevers with pigment.
c. <i>Degenerations.</i>	Waxy, fatty.
d. <i>Inflammations.</i>	Cirrhosis, rarely. Abscess deeply situated posteriorly ; multiple abscesses in interior.
e. <i>New Growths.</i>	Infiltrated carcinoma (rare). Large new growths situated posteriorly.
f. <i>Parasitic.</i>	Hydatids. Situated posteriorly in right lobe as in the case of abscess.
g. <i>Obstructed common or hepatic bile duct.</i>	

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Large livers with nodular or uneven surface.

a. <i>Inflammations.</i>	<i>Cirrhosis</i> , with waxy or fatty degeneration, usually granular surface.
	<i>Syphilitic</i> , at times large nodules with deep cicatrices between, and perhaps gummata. <i>Abscess</i> .
e. <i>New Growths.</i>	Carcinoma, sarcoma; simple cysts (rare).
f. <i>Parasites.</i>	Hydatids.

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Morbid liver with diminution of size. Conditions, etc.

a. *atrophic.*

*Simple atrophy,* Due to old age, wasting disease, pressure of ascitic fluid, etc.

*Congestion.* Nutmeg liver is sometimes small, frequently of about normal size.

\**Acute yellow Atrophy.*

b. *Inflammatory.*

*Thickened capsule* May simulate cirrhosis.  
*inducing atrophy.*

*Cirrhosis.* Most frequent variety, as met with in later stages of disease.

\* Very probably an inflammatory disease.

I have seen several of these conditions in which the liver was not appreciably altered in size. This may happen in carcinoma, where the new growths are small; and in hydatid under similar conditions. So at times, a liver may be fatty and that to a marked degree, and yet not enlarged. So also I have seen one case of acute yellow atrophy of the liver, in which though the liver presented the characteristic changes, its size was little diminished. Let us consider the diagnostic points of these different conditions.

Simple hyperplasia.—Occasionally you are forced to the conclusion that a patient has simple hyperplasia of the liver, from the fact of finding a smooth, painless enlargement of the organ, and nothing but this, to satisfactorily account for it. I have twice met with hyperplasia of the liver, in patients dying with secondary syphilis; so that in case I should meet with a smooth, painless enlargement of the liver in secondary syphilis, and could by exclusion, get rid of the other morbid conditions as a cause for it, I should conclude that it was due to this.

Leukæmic hyperplasia.—The diagnosis turns upon the following points,—a smooth enlargement of the liver.—Enlarged spleen or lymphatic glands or both.—Palor more

or less marked.—Pathognomonic.—The presence of a marked increase of the white blood globules 1:20 and upwards. The increased size of the spleen and lymphatic glands might be absent in that variety of the disease called myelogenic, (due to changes in bone medulla). Whilst I have called the increase in the number of white blood globules pathognomonic, I have meant that it is pathognomonic of leucocythaemia, not absolutely though almost, that an enlargement of the liver under such circumstances, is hyperplastic. There is a bare possibility of the coincidence of some other disease.

To establish the diagnosis of pseudo-leukæmic hyperplasia, is as much more difficult as the diagnosis of pseudo-leukæmia is, in contrast with leucocythaemia. The diagnostic points are similar, save the characteristic one, and in the place of this we have anæmia. I have met with one case in which the spleen was only moderately, and the liver markedly enlarged ; the only other evidence being the anæmia and marked prostration, etc. I would refer such of you as are not familiar with the history of this disease, to articles in the works on the practice of medicine. For it is only by a knowledge of this history, and by carefully excluding the other diseases capable of producing anæmia, with enlarged liver and spleen, or having these latter as coincidences, such as waxy degeneration, cancer, Bright's disease, etc., that a positive opinion can be arrived at.

The congestive enlargements speak for themselves. You have a patient with mitral disease, who has perhaps become slightly jaundiced, and at the same time some dropsical phenomena have made their appearance. The liver is examined and found enlarged and smooth. The patient is suffering from a greater or less amount of dyspnœa. It would require positive evidence under these circumstances, to make out the condition of the liver as due to other cause than congestion. The same is true where free tricuspid regurgitation is present, either owing

ing to primary disease of the ventricle, or to this as secondary to emphysema, or cirrhosis, or induration (from peripheral pressure) of the lungs. With aortic disease I have seen congestion, though it is more rare than with the conditions mentioned.

During the course of severe cases of malarial fevers, especially if somewhat protracted, the liver becomes enlarged owing to congestion, in part I suppose due to the pigment which accumulates in the liver vessels in this disease. This enlargement is usually not great, nor could you run much chance of mistaking it. Yet there are some conditions which might simulate it; one of these is hectic fever imitating malaria, and mistaken for it, as might readily happen in abscess. A microscopic examination of blood taken by a small puncture from clean skin, will help considerably. Care must be taken not to mistake little particles of dirt for pigment; hence it is especially desirable to find it in the white blood globules. If pigment be found, the diagnosis of malaria is established. An enlarged spleen, other causes for such enlargement being absent, is also a pretty sure sign. In leukæmia and pseudo-leukæmia, febrile phenomena may be present, and under these conditions I have seen mistakes occur. That which has been already said about these diseases with this caution will, I think, place you sufficiently on your guard. Again, a waxy liver due to some cause producing hectic, may perhaps deceive you. By attention to the microscopic examination of the blood, and to the rules which govern the diagnosis of waxy liver, you will generally arrive at a correct conclusion. Also avoid mistaking an empyema of the right side pushing the liver downwards for this disease.

The diagnosis of the degenerations of the liver is usually sufficiently easy. Yet I suppose that I have seen more errors in this connection than in any other. Some of them were due to wrong rules in the books. The waxy liver is generally con-

siderably, sometimes greatly enlarged. The slighter grades without or with but trivial increase of size, are not susceptible of diagnosis, though they may be suspected. As a rule to which there are exceptions, the waxy liver has a sharp border; it also has a peculiar firm feel, such that I am often able to tell the waxy parts of a liver partly affected, or a waxy liver with my eyes shut. As the patients are generally pretty well emaciated both the border and the peculiar consistency can be readily made out. The surface is smooth except when waxy degeneration is present with cicatrices due to syphilis or nodules from cirrhosis. I am not aware that the localized waxy degenerations denominated waxy tumors, have given rise to a mistake during life, though I conceive they might. Splenic enlargement from co-existent waxy degeneration of this organ is frequent; and is generally alluded to as a diagnostic point of importance. I fear that you may be misled by anticipating a much more considerable increase of size than usually occurs. My experience teaches me that the sago form is the more frequent; and in this the enlargement may be but little. So also a urine indicating a waxy degeneration of the kidney is corroborative proof. But I think the strongest evidence is offered, by having with the physical condition of the liver mentioned, the proper etiology. Waxy degeneration is dependent upon cachexia; especially upon that due to protracted suppuration; and we can place its causes as a rule under these three heads. *First*, Protracted suppuration. *Second*, Phthisis. *Third*, Tertiary syphilis. A number of the cases in the second, and some in the third classes belong in the first.

I ~~found~~ that it is safe to exclude waxy degeneration, if the causes producing that condition can be excluded. For instance, if you find a patient with a large hard liver, who has not had protracted suppuration, phthisis, syphilis, and who is not cachectic, then the disease is not dependent on waxy degenera-

tion. I have seen several mistakes occur from want of attention to this point. One will serve for illustration. Some years since, a woman was admitted to my wards with an enlarged hard liver, having a sharp border, an enlarged spleen and ascites. I obtained from her a history admitting intemperate habits, but free from the causes for waxy degeneration. I reached the conclusion that she was suffering from cirrhosis of the liver; the enlargement perhaps due to coexistent fatty degeneration. One of my colleagues in the hospital used the case clinically as illustrative of waxy degeneration, owing to the physical characteristics and the enlargement of the spleen. The autopsy revealed a markedly cirrhotic liver, somewhat fatty. Ascites, as a rule, is not present in waxy liver even when marked; and when existing you should suspect coexisting kidney disease, pressure on the portal vein, etc., as cause.

A fatty liver is usually large, with rounded borders, a doughy consistence and a smooth surface. It is not painful nor tender. I have seen exceptions in which the border was as sharp as that of the ordinary waxy liver. Last year on the same afternoon, I had opportunity to exhibit to the class two livers; one markedly waxy with rounded border, and the other fatty with a sharp border. These I mention to guide you in exceptional cases, when the rules ordinarily laid down tend to mislead.

The etiology of the fatty liver is to be found in excessive alcoholic drinking, or food consumption without proper exercise. There is also a form not generally having as much clinical importance due to phthisis, etc., in which the fat taken up from the adipose tissues excess surcharges the blood, and is accumulated in the liver; phosphorus poisoning is also followed by marked fatty change in the liver. The spleen is small in fatty liver, and ascites is absent unless due to a complication.

Slight jaundice, in the more advanced grades of the disease, is present; and, as frequently the heart is the seat of fatty

degeneration, and the kidneys also affected, the liability to mistake in diagnosis is increased. I have seen it occur to such physicians as had experience in similar cases, but were misled by erroneous history of the patient's life and habits. Such a case occurred to me in woman 40 years of age. Her liver was large and smooth. She vomited constantly ; had partial jaundice, and persistently denied all use of intoxicating drinks. The enlarged liver overlapped the stomach and prevented a full examination of that organ. There was no ascertainable cause for fatty degeneration, if her history were relied on. I must confess to forming and expressing an opinion that the disease was due to carcinoma of the stomach, and that possibly there was secondary affection of the liver in such a manner, as not to give rise to nodulation. But the autopsy showed fatty change in the liver, heart, and kidneys, with catarrhal inflammation of the stomach. Her husband who had not visited her while ill, stated that she had been exceedingly intemperate. I have since seen several other cases where the same mistake had occurred to those who relied too implicitly on the patient's word. I must warn you that it is extremely difficult to obtain a history of excessive drinking from women. This is true even of hospital patients who, belonging to the lower classes of society have apparently nothing at stake by an admission, and much more so as you ascend in the social scale. You may sometimes elicit the truth, either by convincing the patient that a correct account is necessary in order that proper treatment may be applied, or by following this course with the patient's friends. There is a certain amount of secret tippling which is unknown even to friends. You must also recollect that a certain number of cases of fatty degeneration of the liver occur, complicating other diseases, which, from the absence of symptoms and signs, are only revealed on the post-mortem table.

Let us next consider the means of diagnosing a cirrhotic

liver. In the first place you must disabuse your minds of the idea, that a cirrhotic liver, which has led to the death of its possessor must necessarily be small. I have seen them large, natural sized, and small. The last is the most frequent ; but the others occur occasionally. When large, the cirrhosis is usually complicated by fatty change of the liver cells—rarely by waxy liver ;—and again the liver may be enlarged by the amount of connective tissue present, which has not yet undergone retraction. I have occasionally met with advanced cirrhosis at an autopsy when no ascites was present, the patient having died of pneumonia, peritonitis, delirium tremens, etc. Yet as far as the history went, nothing leading to an idea of cirrhosis was noted, if we except intemperate habits. Yet I imagine if particular inquiry had been made, a history of some gastric trouble would have been obtained. Cases of cirrhosis present themselves to a physician under four conditions, leaving out of account those instances in which they are treated for some serious complication endangering life, viz :—*First*, with jaundice : *Second*, with symptoms of severe gastric trouble ; perhaps with hematemesis or passage of blood by the bowel : *Third*, with pain, etc., over liver, due to perihepatitis : *Fourth*, Most frequently, when ascites has developed with this. I have grouped the cases in this way because, whilst a patient with cirrhosis may present himself under other circumstances, it is not probable that the physician's attention would be drawn to the liver.

I have seen cirrhosis mistaken for carcinoma, waxy degeneration, catarrh of the bile-ducts, obstruction of bile ducts, or supposed to exist where the condition was portal thrombosis, chronic peritonitis, or colloid cancer of the peritoneum. Again it has been present when the morbid phenomena were supposed to be due to ulcer or cancer of the stomach. Again, Bright's or cardiac disease may exist in a case where cirrhosis is present, and all the phenomena be referred to the former conditions.

Before ascites develops, the diagnosis must largely turn upon the etiology, symptoms, and condition of the spleen.

If a patient who has been a hard drinker, or had syphilis, has marked gastric irritability, perhaps vomits blood—and especially if these phenomena continue—then you must examine into the size of the spleen and liver. If you find the liver small, and especially if you find it to possess a nodular surface, and the spleen enlarged, the case is probably one of cirrhosis. An examination however must be made of the stomach, to see that no tumor is present; also in estimating the importance of the gastric symptoms, avoid mistaking obstruction, either of esophagus or stomach, for the condition mentioned—irritability and vomiting in consequence.

The diagnosis of the case mentioned above is comparatively easy compared with the one I am about to narrate. A woman was admitted into my wards who denied syphilis and antecedent habits of drink, save such as were the result of physician's direction since illness. She had continual vomiting, ejecting almost everything taken into the stomach, hematemesis almost daily, advancing emaciation, and moderate jaundice. Her liver was large, smooth, and so overlapped the stomach that it was difficult to make an examination of the organ. The spleen was not increased in size. In this case I hesitated between a large cirrhotic liver, and carcinoma of the stomach with fatty degeneration of the liver. But the weight of evidence seemed so much in favor of ulcerated carcinoma inaccessible to touch, that after a severe cross-examination of both herself and her daughter about the use of liquor with negative result, and with the absence of anything indicative of past syphilis, I decided in favor of that disease. My colleagues who saw her formed the same opinion. This case was illustrative of a mode of mistake which I have already mentioned; as there was considerable tenderness about the abdomen, she would contract the

rectus abdominis to such an extent, that one gentleman who saw her supposed that he felt a tumor, and was confident of the diagnosis of carcinoma in consequence. The only other thing simulating a tumor was due to the deepened fissures of the liver, owing to its enlargement. The autopsy showed a large fatty and cirrhotic liver, and chronic gastritis without ulceration. The splenic enlargement was not present in this case owing to the hematemesis which relieved the portal congestion. There is another cause which I have seen prevent the appearance of enlargement of the spleen in this disease, even when all the characteristic phenomena were present, and that is firm old adhesion and thickening of the capsule. Free gastric or intestinal hemorrhage will cause marked diminution in the size of a spleen enlarged by congestion. Bear these facts in mind, in order not to place too great reliance on splenic enlargement as necessary to confirm the diagnosis of cirrhosis.

You may perchance meet with marked persistent aundice due to cirrhosis in a case in which the liver is large and apparently or really smooth. The following will illustrate this variety,—About two years ago, I saw a man who was at that time supposed by some to have carcinoma of the liver. He never had had syphilis. He said that he had drunk lager and Schnapps' in moderation. He was somewhat emaciated, and stated that for some time previous he had been growing weaker, had haemorrhoids develop and bleed at times pretty freely; he had become jaundiced; that he also would bleed from nose and gums occasionally; that he had noticed a tumor develop in his abdomen, which grew from under the right ribs and middle portion. He was found to have a markedly enlarged, apparently smooth, firm liver, a normal sized spleen, some though not great ascites, and deep jaundice. Gradually after this the liver became smaller in size, the jaundice less severe, but continued. Moderate ascites remained and some œdema of the legs

occurred. Bile was present in the faecal evacuations. He died some five months after I saw him, and about ten months from the time of his being jaundiced. His liver was then larger than natural, markedly cirrhotic, but only very moderately irregular on the surface as shown at the autopsy.

Now let me ask and answer the following questions : Under what circumstances would we be justified in considering hepatic pain as evidence of cirrhosis ? I think that I should do so if a patient who had been a hard drinker, should come to me with pain and tenderness over the liver, and on examination I should find evidence of roughened peritoneum, either by the direct evidence offered by palpation and auscultation, or indirectly by febrile phenomena not traceable to other causes, and especially if in conjunction with these, gastric irritability or splenic enlargement were present. I would guard against overlooking cold or direct injury as a cause for the perihepatitis. I should form this opinion even if the liver were enlarged, because of the experience which I have already placed before you, and because cirrhotic livers are probably in most instances enlarged in the earlier part of their course.

There is one thing you must remember with reference to the dropsy of portal obstruction, whether from cirrhosis or other cause. It exists below the diaphragm, producing ascites followed by œdema of the legs most frequently, accompanied by it more rarely. It may be that the œdema of the legs shall precede the ascites ; though I have no doubt that in some cases where this was supposed to occur, there was fluid in the peritoneal cavity before sufficient of swelling made it manifest to the patient. Hence follows the characteristic appearance of a well marked case of cirrhosis,—The face, upper extremities and chest are markedly emaciated, whilst the abdomen is largely, distended, its veins probably prominent, and the legs are usually œdematosus. Unfortunately in the nature of things

this is not pathognomonic, but may occur in obstructed portal circulation from other causes ; as thrombosis, and pressure, also in chronic peritonitis, colloid cancer of the peritoneum, large uterine or ovarian tumor accompanied by ascites. The first point in such cases is to determine that the fluid is dropsical ; the second, that such dropsy is due to obstruction of the portal circulation ; and the third, that cirrhosis is the cause for the portal obstruction. We may ascertain about the first by making an exploratory puncture, either with needle of the aspirator, or hypodermic syringe, or with a trochar, etc. I prefer a hypodermic syringe, such as is used in veterinary practice, with a needle of a little larger calibre than in the hypodermic syringe cases we ordinarily carry. I would refer any who desire further information about the use of the hypodermic syringe as an exploratory instrument, to an article which I published in the *Medical Record* of this city on the Diagnosis of Pleurisy and Pneumonia. Ordinarily, the diagnosis of ascites is sufficiently easy, and I prefer to wait until the symptoms call for paracentesis ; and after its performance make a careful examination of the liver, spleen, and other abdominal and pelvic visera. Then the absence of disease of the kidney, heart, and of the last-mentioned organs, and the presence of large abdominal veins, and of a moderate enlargement of the spleen not due to leukæmia, pseudo-leukæmia or malaria, renders the diagnosis of portal obstruction as positive as possible. If the liver is small and nodulated under these circumstances, then cirrhosis is present. But if the liver is small and we are unable to tell whether its surface is rough or smooth, the condition may be cirrhosis, old thickened capsule compressing the liver, or, advanced chronic atrophy. The only method of discriminating these diseases will be by the history. The more prominent the history of drink, so much more probable is the diagnosis of cirrhosis. The same is true of syphilis

with more caution, for I have seen this cause markedly thickened capsule producing the symptoms of cirrhosis in one case. In proportion, as we have absence of cause with an advanced age, do we have atrophy more probable. I have however seen exceptions to these rules which may occur under the following circumstances,—A chronic peritonitis may produce atrophy of the liver from pressure, and hence the ascites be due not to the small liver, but the small liver to the ascites. Chronic peritonitis independent of tubercle or cancer is a rare affection, yet does occur. The exclusion of these diseases as probable events, and enlargement of the spleen, or evidence by hemorrhage from the stomach or bowel, of congestion of the mucous membrane, and the presence of large superficial abdominal veins would be proofs in favor of primary trouble in the liver. The liver may be cirrhotic, yet the sudden symptoms of ascites, etc., be due to a complicating thrombosis of the portal vein. Where the liver has not been cirrhotic, portal thrombosis may occur, and the liver be found smaller than usual. I have not met a case of small liver with portal thrombosis independent of cirrhosis, but you will find such recorded in the Literature of the subject. Portal thrombosis, excluding the variety occurring in the disease called suppurative portal phlebitis, is a rare affection. The diagnosis could be readily made if the following phenomena should be present,—Suddenly developed ascites and enlarged abdominal veins, rapid and marked enlargement of the spleen, rapid recurrence of ascites after tapping and symptoms, as gastric or intestinal hemorrhage pointing to congested mucous membranes in the region of distribution of the portal system. These symptoms however may not all be present, owing to some one symptom as gastric hemorrhage preventing others. In a measure too, the rapidity and completeness of the occlusion has considerable to do with the rapidity of the development of the symptoms. The following

case will illustrate the absence of a symptom which Frerichs and Murchison place as the most characteristic.

I presented the liver at a meeting of the New York Pathological Society in 1870. The patient from whom it had been taken was a male forty-seven years of age. He denied being a man of intemperate habits, and had not had syphilis. He had had two attacks of disease of the lung in nine years, and one of rheumatism two years preceding his admission. He was admitted to hospital for acute articular rheumatism, June 16th, 1869. About three weeks after his admission he first noticed abdominal pain and diarrhoea, and about four weeks later ascites occurred, and in a week the abdomen was filled. The spleen became enlarged, but under the use of diuretics the ascites was relieved, so that in about six weeks he was able to assist in the wards as a helper. He continued to do this work making no complaint until March 11th, 1870. Then he was seized with a chilly feeling, dry tongue, frequent pulse, and in two days jaundice developed and the abdomen was found to contain some ascitic fluid. I saw him for the first time six days after these symptoms had developed. Then his pulse and temperature were normal. I found that he had fibrous induration of the right lung, and marked splenic enlargement. His liver did not seem to be decreased in size, though it was difficult to judge of its exact condition, owing to the condition of the right lung. In reviewing the case, my diagnosis was that the patient had had thrombosis of the portal vein since August, when the ascites had developed; and I then thought that that and the fibrous induration were sufficient in the absence of fever to account for his condition. Yet as I now review the case and the autopsy, I find it difficult to state why, when we found nothing in the autopsy different from what had probably obtained for a considerable time, he should have had the fever, etc., which had disappeared after six days and just prior to my

seeing him. My criticism on my previous diagnosis is, that it was incomplete, and that the probable extra condition was relapsing fever, a disease which was then prevalent and would account for the phenomena, and to which as an attendant in a medical ward he was exposed. It is a confession that my hindsight is better than my foresight was in that case.

The autopsy showed fibrous induration of the right lung, an old firm thrombus almost completely obstructing the main trunk of the portal vein ; a little channel only capable of admitting a small probe remained permeable. The spleen was greatly enlarged, weighing four pounds, and had a deep blackish color. The splenic artery was the seat of calcareous degeneration, and the splenic vein had a calcarious plate in its middle coat, which projected sufficiently in the calibre of the vessel to produce some obstruction to the blood current. To this I ascribe the occurrence of the thrombus. The interesting point is that the ascites disappeared apparently under the use of diuretics, and though it appeared rapidly, it did not require to be drawn off ; nor did it recur. The liver showed the capsule wrinkled, a left lobe large at the expense of the right, probably congenital and its tissue fatty.

Carcinoma of the liver is generally secondary to its occurrence elsewhere, especially to such disease of the stomach, intestines including the rectum, the gall-bladder ; parts which are drained by the portal vein, and also to that of the mamma, etc. Sarcoma is probably always secondary, though its primary site may have been overlooked even on autopsy.

Where only a few secondary growths of either of these diseases exist, and others are situated so as to be inaccessible, it is not possible to diagnose them. But if we find an enlarged liver with nodules in it in a case where a carcinoma or sarcoma is present in some other portion of the body, we may feel pretty confident that these are due to a secondary development of

similar growths. In secondary cancer we have an aid in the umbilicated centre, so generally present in these growths affecting the liver; and in emaciated patients I have found them in two instances accessible to the touch. Again, these growths are generally separated by a greater or less portion of liver tissue, and grow out from this; whilst in cirrhosis, the nodulations would be smaller, more regular, and separated from one another by depressions. The latter part is true of a lobulated syphilitic liver, which also has the natural consistence unless degenerated. In this first series of cases the diagnosis is sufficiently easy, in a second of which I have only seen one illustration, the diagnosis is more difficult. It consists of cases in which the liver is enlarged, presenting a smooth surface. The carcinoma is infiltrated so to speak, or substituted for the liver tissue, or whilst the interior may show nodules the exterior is smooth.

The case which I saw was secondary to cancer of the mamma. The liver was firm, smooth, enlarged. There was a moderate degree of jaundice present; at the same time there was an absence of causation for cirrhosis and waxy degeneration. The spleen was apparently not enlarged. Under these circumstances I felt justified in pronouncing the disease of the liver infiltrated carcinoma, a condition which was proven by the autopsy. Under these conditions which I have mentioned, the diagnosis is not very difficult; i.e., where a primary cancer or sarcoma exists elsewhere, demonstratable by touch, sight or symptoms. But it becomes different at times when the liver is primarily affected, or the primary seat is not ascertainable during life. I have already alluded to cases of other diseases of the liver supposed to be cancer. Abroad hydatids are frequently mistaken for cancerous affections. We fortunately do not have this difficulty to contend with to anything like the same extent. Hydatid disease of the liver or of the body

is an infrequent affection with us ; so, that I have met with it in only three post-mortem examinations. In none of these were the sacs large enough to do any injury and had produced no trouble. Two were found in livers which were the seat of lacerations from injury. In fact it would be scarcely necessary to consider this disease in making a diagnosis, were it not for the fact that you are liable to meet with an exceptional case in which they may be present.

The diagnosis in these last mentioned cases would be made by the absence of disease of other organs to account for the weakness and emaciation which characterize this disease as it progresses, and the demonstration that the liver is the seat of disease. You may find it enlarged with firm nodules of unequal size, perhaps some of them unbilicated. The history shows that this enlargement has developed more or less rapidly, and has been attended by pain. If you are once certain that there has been no syphilis or intemperance then, in the absence of unbilicated nodules, and if there be only obscure feeling of nodulation, be on your guard against mistaking cancer for cirrhosis. For the same symptoms may be present in cancer as have been pointed out in cirrhosis. But you ask how shall we decide ? I answer, that if the liver grows larger and the nodules more prominent your diagnosis of cancer is secured. If on the other hand the liver becomes smaller, and ascites, etc., become manifest, you have to deal with cirrhosis. In cancer too the spleen is usually of normal size or only a little enlarged, and we are not so liable to those results of obstruction of the portal system. Jaundice and ascites will not help you further than that ascites and persistent jaundice with a small spleen, in a case where hemorrhages were not occurring from the stomach or intestines, would point pretty decidedly to cancer. You must remember that it is possible to have portal or hepatic thrombosis take place in cancer with their results. On the

other hand, if the tumor or tumors present in the liver be of medullary nature, they are softer and sometimes give a deceptive sense of fluctuation. The diagnosis will turn between abscess of the liver, hydatids, or cancer. In some of the rapid growing cancers fever may be present, so that the diagnosis between abscess and cancer may become difficult. In such a case if the subject be young the probabilities are in favor of abscess. Again, abscess of the liver is rarely idiopathic in our climate, but is either traumatic or else dependent on ulceration of some portion of the intestine or its neighborhood, or due to pyæmia from the systemic circulation, or to ulceration, or inflammation of the gall-bladder or ducts.

The absence of any evidence of these diseases, on a careful and perhaps on repeated examinations, and of hectic type of temperature, of the chills and sweats of pyæmia, and of sweet breath would be proof that soft tumors were not abscesses. If they grew rapidly, undermined the strength, and produced wasting of the body, the diagnosis of cancer would be confirmed. For hydatids grow slowly, are borne with immunity for a long period, unless they chance to suppurate or to burst. In the one case we would have the symptoms of abscess, and in the other events depending on the situation of the rupture. Again in a large cyst you would have the sense of elasticity and the hydatid fremitus. This will serve to indicate the main points of distinction; but if you desire fuller information you will find enough in the foreign literature.

In the case of a primary carcinoma of the liver without demonstratable tumor, the diagnosis will depend considerably on the position of its growth; if it should spread along the gall ducts and produce jaundice, it will very probably be mistaken for obstructive jaundice from some other cause. You will only be able to discriminate the different conditions by a rigid inquiry into the method in which the jaundice developed itself,

by observation of its persistence, by a study of the probable etiology, of the subsequent history of the liver, and of its effects upon the general health in the light of remarks which have preceded. Avoid expressing a positive opinion before you have—as a result of such observation and study—obtained sufficient evidence to warrant it. If jaundice is absent you will lose a guide that points to the liver as the seat of disturbance, and you will have your attention drawn to it, either as the result of a physical examination of all the organs in the search for some cause which is undermining the health, or because the patient has had his attention drawn to an enlargement of the liver, in which you find no distinct tumor.

I have already—in speaking of the diagnosis between carcinoma and abscess—pointed out the main points of distinction in favor of abscess; but I desire to say a few words upon the subject. The etiology I have already given. The origin from dysentery is the most frequent according to my experience in this city. A few cases of this variety are observed in the Bellevue Hospital autopsy room each summer and autumn. And it is my opinion that it occurs more frequently in private practice than many of the physicians of the city are aware of. Let me briefly narrate the salient points of two cases. The first occurred this summer in an adult male who was admitted to my wards in a somewhat typhoid state. He had had an attack of dysentery, but it was not severe at the time of admission. There was some pain and tenderness over the hepatic region, and a friction sound was audible, and a friction fremitus perceptible over the right lobe of the liver. The liver was somewhat enlarged, smooth without apparent fluctuation. The breath was sweet. The liver pressed more in an upward and backward direction, somewhat compressing the lower lobe of the lung, and to this later hypostatic pneumonia was super-added. He had an hectic type of temperature. The house

physician Dr. Taylor, introduced the needle of an hypodermic syringe without obtaining pus. The autopsy showed dysentery, with large abscesses of the right lobe of the liver situated deeply and posteriorly, and hypostatic pneumonia of the right lung. Had it not been for previous experience in such cases, I should have been satisfied with the diagnosis of dysentery and pneumonia. The train of reasoning which led me to feel confident that there was an abscess of the liver, was :—The liver was somewhat enlarged and smooth, there was some disease at the same time producing inflammation of its capsule ; general peritonitis was absent. The system was more profoundly affected than the dysenteric symptoms accounted for. There was a sweet breath probably indicative of suppuration in the body ; dysentery rendered it probable, and the inflammation of the capsule of the liver nearly certain, that this suppuration was occurring in the liver.

The other case I saw in consultation with Dr. Shine, of this city, several years ago. The doctor asked me to decide the question as to whether a man was affected with abscess of the liver or aneurism of the aorta. He had taken ground in favor of the former disease in opposition to other physicians. The patient was a sailor who had had dysentery some six weeks before while coming from India. He had fever, and an enlargement in the epigastric region which showed that there was some implication of the abdominal wall, as this was somewhat tumified and oedematous. The tumor was somewhat elastic ; fluctuated on palpation, and pulsated synchronously with the heart. This pulsation was however not expansile, and there was no bruit. I decided from these facts in favor of an abscess of the left lobe of the liver and advised an exploratory puncture with the hypodermic syringe needle. No pus was drawn by the syringe, but a drop followed the removal of the needle. I then advised a free incision which gave exit to a large quantity of

pus. I might add that he did very well after this, for a time, went to Glasgow, and having allowed the opening to close, died in a hospital from rupture of the abscess into the peritoneal cavity. These cases suffice both as illustrations, and as indicative of the method of arriving at a diagnosis.

There is a condition called suppurative portal phlebitis, which is at times recognizable, and at others proves the most obscure disease possible. I have observed cases of it due to inflammation of umbilical vein shortly after birth, to portal thrombosis due to fish-bone in the vein, to perityphilitis, to retro-rectal abscess, and one recently in a case of impacted gall stone. Portal thrombosis had occurred in this case in the right lobe, owing to periphlebitis, and the thrombosis in some portions was mushy; and had the patient not died of complications, I feel pretty sure it would have led to this disease. Not a few of the multiple abscesses considered as primary could, if sufficient care were exercised in the autopsy, be referred to this condition.

The distinguishing features are those which I have already mentioned as distinctive of abscess, with the limitation, that the primary inflammation or suppuration is limited to the region of the portal vein distribution, or to such as that these vessels might be involved by an extension of the process. I have already published the case of portal vein thrombosis following the entrance of a fish-bone; having presented it to the Pathological Society of this city. I saw an extremely puzzling case of this disease this spring, in the service of my colleague, Prof. Polk. The case was that of a young man with colicky pains in his abdomen for some time of extreme severity, fever of hectic type, emaciation, no enlargement of liver or spleen, be-

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I have met a case of forming idiopathic abscess of the liver since writing the above, much resembling a carbuncle in its anatomical features.

coming after an illness of over a month, delirious and then unconscious with coma. He had no evidence of suppuration anywhere on a careful examination which I made on two occasions to satisfy myself ; and on one occasion I showed him to my diagnosis class as illustrative of the difficulty attending the diagnosis of some hidden internal suppuration and miliary tuberculosis. I went particularly over the point of perityphilitis and secondary suppurative portal phlebitis. The bowels were retracted and yet I could get no evidence of it even under these favorable circumstances. I confess that sweet breath was present and that though I observed it, with such negative evidence of abscess, I failed to give this its just weight as a deciding symptom. There was no jaundice nor perihepatic friction nor murmur. Under these circumstances I reached the conclusion, that the case was one of tuberculosis, finally producing tubercular meningitis. But the autopsy showed that the disease was originally due to ulcerated vermiform appendix, which was bound down behind the colon with no distinct abscess ; only a little dry pus about the size of the end of my little finger around it posteriorly : that there was some connective tissue induration of the iliacus muscle and cellular tissue covering it at this point : that the portal vein radicles were completely thrombosed up to the superior mesenteric and portal ; and that there were secondary abscesses in the liver and brain.

The disease is apt to be mistaken for typhoid or remittent fever, or tuberculosis, or to be considered as due to the primary disease. Jaundice and splenic enlargement as in the cases mentioned may both be absent. Ascites does not as in portal thrombosis simplex form a feature of the disease. From abscess it is only possible to distinguish it in those cases in which the spleen becomes enlarged, or hemorrhage from the stomach shall show obstructed circulation. Singularly the abscesses of

dysentery are apparently independent of this process. The examination of the portal vessels does not, in my experience, reveal the connection between abscess of the liver and dysentery. Yet I firmly believe that it is owing to the propagation of irritants by the portal circulation to the liver.

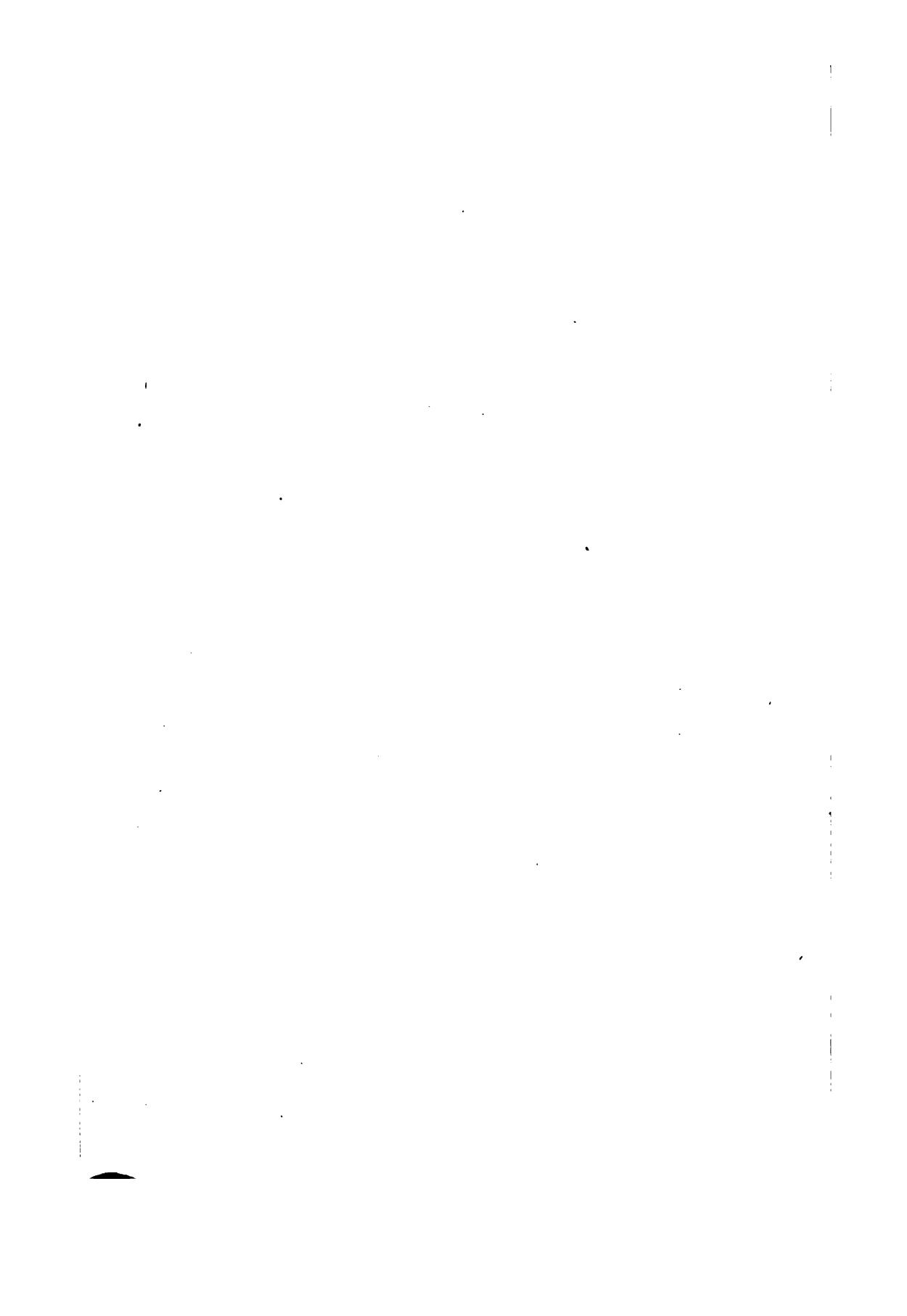
I have met with four cases of acute yellow atrophy of the liver. One I saw while an interne in Bellevue Hospital. Two occurred in my service while visiting Bellevue Hospital, and I made a post-mortem examination of the fourth at the request of the coroner. You will see that my experience with this disease has been greater than with hydatids. The age of the case investigated for the coroner was probably thirty. Another occurred in a male aged thirty; the third in a young man of twenty years; and the fourth in a young woman twenty-one years of age, (a prostitute), whose history is recorded in Prof. Flint's work on practice. In neither of the females whom I observed was pregnancy present.

The diagnosis of this disease at its outset presents considerable difficulty. In the young man who was under my charge, the symptoms were those of jaundice from obstruction. There was no fever; nor in fact until two days before his death, did he manifest any symptom indicative of serious illness. Then coma and convulsions led to a re-examination of his liver which was found diminished in size, and for the first time fever made its appearance. The bile was absent from the feces for the time that he was under observation. In the earlier part of his sickness his liver was not found to present anything abnormal. I have seen cases with similar symptoms in young people as those presented by this young man until the last days of his life; and those cases made the impression on me of being jaundice due to catarrh of the ducts. That was the diagnosis which I made in the earlier part of this young man's illness; when however febrile

phenomena, convulsions and coma occurred, and the liver was found diminished, the diagnosis was changed to acute yellow atrophy, a condition found on autopsy. I made a rigid inquiry of all possible causes when he was first admitted, phosphorus included, but with negative results. The second case occurred in a man, boatman by occupation, admitted to Bellevue Hospital during my term of service. He was deeply jaundiced, unconscious, could give no history of his previous illness. In the absence of evidence of other disease, and with the presence of small liver, deep jaundice, delirium and unconsciousness, I concluded that I had to deal with a case of acute yellow atrophy. The urine in the first case during the time of serious illness, and in the latter during the whole time in hospital, was voided involuntarily, and I was unable to obtain it for examination. The diagnosis it is evident must turn upon a diminution in the size of the liver, occurring often rapidly, taking place in a young person usually between twenty and thirty years of age ; the presence of deep jaundice leading to poisoning of the nervous centres and producing delirium, coma and convulsions : the absence of other cause to account for it, and in some cases at least the presence of leucine and tyrosine in the urine. The kidneys are affected as the liver. Fever does not seem essential ; for in the first young man it was only present during the last two days of life, and in the second was absent during the same period. Neither are hemorrhages which frequently occur. In the case which I investigated for the coroner, the physician who had attended her from a dispensary had pronounced the disease yellow fever, in consequence of the deep jaundice, and an accompanying coffee ground vomiting. There was no other evidence to support such a conclusion, and the duration of her illness—three weeks—opposed it.

I have already taken more time than I had intended, and with these remarks must close this lecture. I have endeavored

to present these diseases to you as I have found them occurring in my own field of observation, and to lead you as I have been led, to frame a certain method by which to attempt their diagnosis. I have used my own mistakes as well as those of others as beacons, to warn you against certain dangers which beset your path. I hope that they may subserve a useful purpose, and prove a means of somewhat lightening your labors. Obstructive jaundice and some other diseases I must reserve for a future occasion.



## THE ETIOLOGY AND PATHOLOGY OF CHRONIC JOINT DISEASE.

BY

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ACCOMPANYING chronic diseases of the articulations, there are several interesting and instructive phenomena to which I would like to call your attention, and I wish especially to refer to them, as pertaining to the etiology and pathology of the lesion. In adopting this course, I propose, so far as possible, to give the results of my own observations, which are based upon an experience gained in following many cases in the service of the Orthopædic Dispensary and Hospital, supplementing them, as occasion demands, by illustrations drawn from other sources. The questions involved are very suggestive, and the limits of this lecture will not permit me to do full justice to the subject. I shall therefore strive to be both concise and practical in my remarks.

In order to avoid ambiguity and repetition, I wish to state at the outset, that in using the phrase "chronic joint disease" in my remarks, I refer, unless otherwise stated, to that form of articular disease, of which we may take morbus coxarius as a type. The various terms "arthritis," "synovitis," etc., all have

a more limited meaning than the comprehensive appellation I have chosen to designate the lesion under consideration; for if I interpret the matter rightly, we mean far more in saying that a patient has "joint disease," than by simply stating, for instance, that the individual has an "arthritis." The former carries with it a sense of chronicity which does not pertain to the latter.

From whatever standpoint we may regard the etiology of chronic joint disease, its peculiar clinical history, and its many unfavorable sequelæ will be generally admitted. As usually met with, the symptoms of this form of articular disease are indicative of a progressive lesion, chronic in its nature, not preceded by any acute symptoms, and unaccompanied in its earlier stage by any marked febrile excitement. It is difficult to control, whatever be the treatment employed. It not unfrequently terminates in suppuration,—ultimates in various deformities and atrophy of the limb,—and death ensues in a certain number of cases. The insidious character of the initial symptoms, as followed by the gradual development of the limp, the inconstant character of the pain, the progressive debility of the limb, the impaired mobility of the articulation, the atrophic disturbance of the muscles and their peculiar spasm, are sooner or later succeeded by the more expressive indices of the lesion, which, as it finds expression in deformity and suppuration, gives rise to results which are familiar to all. It is a disease too, in the very large proportion of cases, of early life, occurring during the period of development, when nature's powers of resistance to the invasion of a chronic disease are at their maximum; but also where in certain conditions of the constitution an exaggerated physiological condition is readily converted into a pathological one: and where, a slight lesion being established, a retrograde takes the place of recuperative action. It is not in short an *acute*

disease in any sense, but one developed in obscurity, and progressing through all its stages attended by symptoms which can only be called *chronic*.

The definition given by Prof. Gross, to chronic inflammation, so well answers that which might be applied to a chronic joint disease, that I quote it here,—“ chronic inflammation, however provoked, is generally tardy and sluggish in its movements, creating little constitutional disturbance, but not on this account the less surely and effectually undermining the part and system. In the acute variety, the action is rapid, bold, daring ; suffering is severe, and constitutional response loud and unmistakable. In chronic inflammation, on the other hand, the symptoms are, as already stated, often obscure, if not absolutely masked, and the embers of disease never break out into open flame. The disease may continue weeks and months, now stationary, smothered or apparently receding ; now advancing and seeming almost ready to assume the acute type.”\* Describing the effects of chronic inflammation, Dr. Gross further says,—“ The most common and important of these changes, are suppuration, ulceration, softening, adhesion, contraction, induration and enlargement.”\* Though this is the definition of chronic inflammation, accompanied by a description of its effects, I doubt if the history of chronic joint disease could be better described in so few words.

Subcutaneous local lesions, having traumatism as a cause, and involving non-vital organs (especially the upper and lower extremities) are, as a class, the simplest, so far as treatment and results are concerned, that fall to the lot of the surgeon. They are simply *local lesions*, which run an acute course, and even if neglected and abused, rarely terminate in suppuration. This accident is liable to occur only in those conditions, where

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\* A System of Surgery, by Prof. S. D. Gross. Vol. I, p. 105.

either from hereditary or acquired causes, there exists an impaired nutrition. These purely local lesions are to be regarded as likely to be followed by serious consequences, as a class, under such circumstances as those which Mr. Paget describes in his "Calamities of Surgery,"\* where a slight lesion may be followed by exaggerated results, and the minor *cause* may easily become the *occasion* for retrograde, rather than a reparative process. Examples of these conditions are met with in daily practice, and the wards of our hospitals afford ample opportunities for demonstrating them. So far as the articulations are concerned, perhaps the typical lesions excited by traumatism, at least the most common, are those produced by sprains. We know how severe they may be, and how chronic they may become. The joint may be stiff and useless; extra, or even intra-capsular adhesions may form as the result of the inflammation excited, by sometimes comparatively slight, and at other times very severe injuries; or the joint may become practically useless, exquisitely sensitive on pressure at certain points, and yet suppuration rarely ensues. None of the characteristic symptoms of chronic joint disease supervene in my own experience, nor has it in the experience of those I consulted. The pathology of this condition has been recently very concisely described by Prof. R. O. Cowling. I quote the following from his paper,—“Languor in the circulation is the prominent feature and the key to most of the conditions. There is mal-nutrition, local in its origin. Plastic deposits resulting in the inflammatory stage, or slowly gathering as the result of the chronic congestion, are not taken up. Tendons, ligaments, and apon-neurosis are shortened by continued disuse. The bodies of the muscles waste and then contractility is lost. The nerve structure has not been repaired. New fibres have been de-

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\* Clinical Lectures and Essays, by Sir J. Paget, page 51.

veloped in adventitious tissue, and they alike cry for good blood and moving blood. With such a condition of affairs, loss of function, pain, and tenderness naturally continue.\*"

In chronic joint disease the condition is far different. There is no plastic material thrown out; no adventitious tissue is formed. The mal-nutrition is not local in its origin, but general, and in the place of the higher inflammatory products a "regressive metamorphosis" occurs, that ultimates in the formation of a degenerate pus, filled with cheesy flocculi and necrosed cellular tissue. The sprain is the legitimate result of traumatism. The joint disease frequently does not require any blow or fall to excite the local symptoms of the lesion, the morbid elements of which antedate the injury even if it were received. The whole animal economy calls for "good blood and moving blood," not the joint alone. The entire system needs assistance in establishing a normal reaction in the part which is but indicating the general condition. In other words, the joint lesion may frequently be called a symptom; a symptom of sufficient importance however to require extensive local treatment.

If we take, for example, a case of chronic joint disease at the earliest manifestation of the local symptoms, and treat it *locally*, as we would a fracture or a dislocation, can we assure ourselves that we will arrest the disease? Can we even feel certain that pus will not form? I do not mean to disparage local treatment in joint disease when I say that we cannot. On the other hand, a local lesion in a healthy individual requires no constitutional treatment, and even in the severer injuries of the articulations,—such as fracture near a joint, or a dislocation, where the nutrition of the articulation is materially

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\*The Pathology and Treatment of Sprains.—*Louisville Medical News*, May, 19th, 1877.

interfered with locally, and its ligamentous and capsular structures lacerated, the symptoms of a chronic suppurative inflammation rarely follow. To summarize,—Experience proves that traumatism excites acute lesions only, as a rule. In those constitutions strong enough to resist and repair the injury, these acute troubles soon subside; under reverse circumstances, they are apt to be followed by a chronic form of inflammation, which may end in suppuration. As applied to joint disease, traumatism is not a prolific cause of chronic inflammation, except in the conditions noted, and then it acts as an *exciting* cause only. We may state still farther. Traumatic joint lesions (excluding incised wounds of the capsule) are not very frequently seen, unless we accept sprain and dislocation as being lesions of this character. When however, these typical traumatic joint lesions occur, they present symptoms that are unmistakable. They no more resemble the ordinary forms of chronic joint disease, in their course and history, than a fracture resembles a chronic osteitis. The comparison may be carried still further. Traumatic joint lesions, as a class, recover (as compared with the chronic) rapidly, while chronic joint disease runs a course of years. Acute joint disease (*synovitis*,) does not usually, in my experience, degenerate even in strumous individuals into a chronic form of inflammation, while chronic joint disease has an antecedent history, which, like the prodromata of acute hydrocephalus, is vague and indistinct, and it is not until some expressive local symptom presents, that the disease is really recognized. It is chronic from its very outset, and depends on a predisposing condition which has been variously defined and vaguely stated by different authorities. I cannot describe it better, than by stating that the condition is accompanied by a diathesis, that is characterized by an abnormal vulnerability which depends on an acquired or hereditary predisposition to chronic inflammation, the tendency of which is to a regres-

sive metamorphosis, rather than to the formation of plastic elements.\*

In the great majority of children that have presented for examination, both in Dispensary and private practice, with chronic joint disease, the first symptom noted by the parents has not been pain—that which we would expect to find were the cause traumatic—but a limp. This limp would be preceded by a fall in many of the cases, (for how many youngsters are there who have escaped a severe fall,) to which the parents attached a greater or less importance.' But in all cases, with a few exceptions, the injury was followed by no acute symptom, nor any manifestation which could be traced to a definite local lesion. In those cases where I have had the opportunity to examine the patient in this stage of the disease, I have found no constitutional disturbance, the thermometer indicating a normal degree of temperature. Pain generally, but not always, can be excited by some of the various movements of the articulation, which are resisted in some of the normal arcs of motion by a peculiar spasm of the muscle. The patient presents a peculiar attitude, bearing his weight on the sound side, flexion of the joint occurs, and with it other symptoms which depend on the locality affected. This obscure condition is not unfrequently simulated by some slight trouble, or acute peri-articular lesion. On some future occasion, I shall dwell upon this point in detail. I need only say now, that if in such a condition as I have described, a high temperature ( $100.5^{\circ}$  or over) exists, do not make a diagnosis of chronic joint disease. Suppuration in the early stage of any chronic disease is not likely to occur. If you have a high temperature, the chances are that your "joint disease" will disappear in a few days or

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\* Modified from Birsch-Hirschfeld's definition of Scrofulosis, Vol. XVI of Ziemssen's Cyclopaedia of Medicine, page 761.

weeks, and without the aid of any extension or other mechanical support. All the prominent symptoms may be present, such as flexed and an adducted thigh (if the hip be suspected) muscular rigidity preventing free movement of the joint; flattening of the natis, obliteration of the gluteo-femoral crease, pain on concussion, pressure, at night, etc.; but a high temperature indicates just that condition which does not exist in chronic joint disease, unless active suppuration be present.  $99^{\circ}$  to  $100^{\circ}$ , (sub-lingual) I do not, in children, regard necessarily as an abnormal temperature, though the latter is always suspicious. Still, I have watched and followed several cases where it existed for some weeks, and in one case months, without any sequelæ. It is a safe rule never to make, especially with but one examination, a diagnosis of chronic joint disease, in the early stage, where the temperature is  $101^{\circ}$  or over. A high evening temperature, with a fall to  $99^{\circ}$  or thereabouts in the morning, may indicate (and in joint disease generally does indicate) suppuration. But accompanying this condition are other symptoms which I cannot here stop to point out.

I will relate, as illustrating the diagnostic value of a high temperature under the circumstances just mentioned, the history and result of a case which I have recently seen.

Mary Smith, aged 10, was admitted to St. Luke's Hospital, on October 16, 1877, during the service of Dr. J. L. Little. I happened to be making my usual daily round when Dr. Little examined the patient. He asked my opinion regarding the case, the history of which was as follows: Several months ago the patient had typhoid fever. Eight weeks before her admission, while convalescent, she fell from the bed to the floor, a distance of about two feet, striking upon her right hip. Several days after she complained of pain in the region of the hip, and a few weeks later, the mother noticed a considerable swelling, and great tenderness about the trochanter major. This in-

creased up to the time of admission. Two weeks ago, the patient, who had been limping about, became unable to walk alone. On admission, there was evident a considerable swelling in the region of, and below, the trochanter major, with distinct fluctuation. The limb was flexed on the pelvis at  $30^{\circ}$  and slightly adducted. Upon examining the limb and joint, I found that the movements of the latter were very limited, flexion of the thigh stopping at  $45^{\circ}$ . Adduction and abduction were very slight. Rotation limited, extreme attempts at motion in this direction being accompanied by pelvic movements, and extension could not be executed beyond the  $30^{\circ}$  of flexion. Any sudden motion of limb caused pain. Pain not increased by pressing articular surfaces together. The patient was very greatly emaciated, and the thighs equally atrophied, were about eight inches only in circumference.

A hip joint lesion was so closely simulated by the objective symptoms, that upon a casual inspection, I felt inclined to diagnose a morbus coxarius. A careful examination, and a consideration of the history, caused me think differently, and the temperature being  $102^{\circ}$ , I at once decided that it was an acute extra capsular lesion, an opinion also which Dr. Little held prior to my examination. The subsequent history of this case, the progress of which I noted frequently, I append in full, from notes furnished me by Dr. Alonzo Blauvelt, House Surgeon.

Oct. 17. Patient etherized, and abscess opened freely by Dr. Little, under Lister. About a pint of thick healthy pus evacuated. A digital examination failed to connect the abscess with the joint. Drainage tube inserted and Lister's dressings applied.

Oct. 30. Wound has been dressed every second or third day. Lister's antiseptic precautions and dressings being carefully followed. At this date very slight discharge. Drainage

tube removed. Temperature has ranged from  $99^{\circ}$  to  $101.5^{\circ}$  in A. M., and from  $101^{\circ}$  to  $103^{\circ}$  in P. M. Patient able to move limb in every direction with very little pain. Tonic treatment ordered.

Nov. 15. Wound dressed only about once a week since last record. Entirely healed except a small sinus made by drainage tube. Probe can be passed about  $3\frac{1}{2}$  inches upwards, and a little forwards. Temperature lower. Bals. Peru injected in sinus, and compress over parts. Good motion of joint without pain.

Nov. 30. Sinus entirely healed. Patient allowed to walk around. Temperature nearly normal. Has increased much in flesh. General health improving rapidly.

Dec. 6. Limb can be moved in any direction without causing any pain whatever. Joint motion normal. Patient walks about ward the entire day, with a scarcely perceptible limp. Temperature normal.

I am indebted to my colleague, Dr. Charles McBurney, under whose care the patient now is, for permission to report this interesting case.

To return to the limp. I stated that it might be accompanied by pain. The pain however like the limp is indefinite and vague, and sometimes remits, and not unfrequently changes its location. The parents are apt on these accounts, to call it a "growing pain." But the limp returns. The pain becomes, perhaps suddenly, persistent. It disturbs the patient at night, and is sometimes accompanied by a cry resembling that which occurs in acute hydrocephalus. The child does not fairly awake during these paroxysms. But the cry is peculiar, and the incoherent mutterings are not remembered even if the patient be fully awakened. If the disease be located in the hip, the thigh begins to flex; the joint motions are limited; the muscles begin to waste, and the patient now

walks very badly. Symptomatic fever sooner or later ensues, with a temperature curve that reaches its maximum in the evening, and that touches nearly normal in the morning. Pus is forming, though we may not have external evidence of it for months, when a "cold abscess" will appear. Finally, the patient suffers excruciating pain; the already weakened constitution sympathizes very evidently, the face assumes a care-worn, aged look, and a progressive general atrophy of its various tissues, indicate the extent to which the system is impaired. The abscess discharges copiously an ichorous, shreddy pus. The probe reaches carious bone through the sinuses thus established, and in some cases the patient succumbs, either from exhaustion, or from amyloid degeneration. The very great majority of cases of chronic joint disease, properly treated, do not terminate fatally, but the disease in any event, whether terminating in suppuration and caries, or whether arrested prior to these unfortunate complications, is a very chronic one, requiring a long and persevering treatment, and the result is not, as a rule, a symmetrical limb with good joint motion, but a shortened, atrophied member, useful, no doubt, and strong, but not perfect.

I have tried not to overdraw this sketch, and as illustrated by the average cases of chronic joint disease which have applied to the Dispensary, it is not exaggerated. I wish to ask if it resembles, in any important respect traumatic lesions as applied to the same structures? Does a disease, so essentially progressive, so persistently chronic, so slowly responsive to both local and constitutional treatment, develop from a simple local cause, (so frequently guessed at by the parents, and adopted by the surgeon on this authority,) and which, passing through its primal stages almost unnoticed, or at least, without constitutional disturbance, progresses slowly though surely, until suppuration sends the mercury up to  $101^{\circ}$ — $105^{\circ}$ ?

Joint disease may be either acute or chronic; when acute, it usually affects the synovial membrane; when chronic, I believe it most frequently has its origin, especially in the hip joint, in the osseous structure, (epiphysis). The former, sometimes difficult to control, and generally idiopathic, passes through its various stages, and in my own experience, as before remarked, even in strumous children seldom develops into the typical chronic joint disease. Acute inflammation of the synovial membrane is not very frequently seen in the hip-joint. The knee is its favorite seat. When however, it does affect the hip, the lesion can scarcely be mistaken for any other condition. A high temperature, an acutely sensitive joint, a rapid pulse, a "swift atrophy of the muscles," the whole generally preceded by a chill, and with the local symptoms pointing to the affected articulation leave very little room for doubt. A typical case of this somewhat rare affection, and presenting some interesting and peculiar features, occurred in my private practice not long ago. The history is as follows: On Sept. 10th, 1876, I was called to see, in consultation with Dr. A. W. Catlin, of Brooklyn, a little girl, Lucy H., aged 10. Two or three days previously the patient had been to Coney Island, and in returning late in the evening, complained of feeling very chilly. She went to bed immediately upon her arrival home, feeling somewhat ill. During the night she was seized with a violent pain in the hip, and fever rapidly supervened. When examined by Dr. Catlin the following morning, the hip joint (right) was found to be very sensitive, both upon pressure and motion. The thigh was flexed, *abducted* and apparently *longer* than its mate. Temperature  $102.5^{\circ}$ , pulse rapid. Counter irritation and antiphlogistic measures were employed. The malposition remaining, and the lengthening of the limb being not only apparent but *real*, we met in consultation as above stated.

Upon examination, a most peculiar condition of affairs was

made manifest. The rational symptoms all pointed to an acute disease, but the physical strongly suggested a dislocation. The pelvis was tilted downward on the affected side, the trochanter was apparently displaced downward and backward, an actual depression existed in the femoral region, and the limb rotated outward, flexed and abducted, was after careful measurement found to be three-eighths of an inch longer than its fellow. Accompanying this condition, was a marked atrophy of the gluteus maximus and quadriceps extensor cruris. Slight motion produced very severe pain. The temperature was still high, ( $102^{\circ}$ ) and all the indications of fever were present. The acute symptoms were easily accounted for, and pointed to an acute synovitis of the hip-joint. But how with these symptoms were we to account for the actual lengthening? In view of this latter fact, a diagnosis other than acute synovitis was not made.

Two days later we met again, when the pain having modified to a considerable extent, a more thorough examination was permitted. The lengthening was still present, and the position of the thigh was not changed. Palpation and a careful examination of the joint proved that there was no displacement. I then stated my belief that the lengthening was congenital, and could be thus eliminated from our differential diagnosis, and that the trouble was simply an acute synovitis of the hip, with the characteristic muscular atrophy, as mentioned by Sir James Paget.\* The position was, I believe, due to the muscular contraction,† and the "acute atrophy" of the extensors of the leg occasioned the "depression" in the femoral region. As the patient was of decidedly strumous habit, a careful course of treatment was pursued, which ultimated in complete recovery, including a restoration of the atrophied muscles. This length-

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\*Op. cit., page 209      † See my paper on "Reflex Muscular Contraction and Atrophy in Joint Disease." etc.—*Archives of Clinical Surgery*, June, 1877.

ening of three-eighths of an inch still exists. An examination of the father of the child, subsequently, developed the fact that his *left* leg was one-half inch longer than the right, a condition that he said he had often suspected, from the complaints of his tailor.

A bad hereditary history caused us to fear, during our treatment of this case, that the acute trouble might degenerate into a chronic form of inflammation. But no such complication ensued. The recovery, as stated above, was perfect. I have never seen an acute, suppurative synovitis of the hip. When it occurs at the knee-joint, the symptoms are pronounced. Our standard works on surgery treat fully of this condition. The treatment of the joint lesion not unfrequently terminates in amputation. As generally seen, however, it results from incised wounds of the capsule. I distinctly remember an instructive case of this kind, which I saw in the year 1866. The patient had been discharged from a prominent hospital, because he declined to submit to amputation. I found him in a dark room at the Five Points, surrounded by the most unfavorable sanitary influences. Through sheer pity I promised to attend the boy, (he was twelve years old), though without the faintest idea of doing more than easing his path to the grave. The knee-joint (the site of the disease) was wholly disintegrated. Pus had burrowed underneath the fascia in all directions. I made in all, five free incisions in different parts of the limb, one in the upper part of the thigh, and adapted a simple posterior splint. Stimulants and nourishment were supplied by a neighboring charitable institution. The boy made a good recovery, and had, the last time I saw him, an ankylosed joint in a good position. And this recalls another point to my mind which is worthy of remark. It has sometimes occurred that advanced cases of joint disease, exhausted by hectic, and wasted by suppuration, have been discharged from a hospital "to die at home,"

sometimes at the request of friends. I have seen several such cases afterward with sinuses healed, with health apparent in every expression, and with good, strong, ankylosed joints. I submit these facts simply stating that I have frequently thought, while following advanced cases of profusely suppurating joint disease in hospital practice, that the aggregation of similar cases is contra-indicated. My experience leads me to believe, that, after a lengthened sojourn in a hospital ward, these cases progress much better if removed, provided, of course, that efficient surgical attendance is given, even if the sanitary and hygienic conditions of their homes are not all that could be desired.

I wish now, in contrast with the case of acute synovitis of the hip-joint, (Lucy H.) to relate the history and progress of a case of chronic osteitis, involving the same articulation.

Alice Dormer applied at the Orthopædic Dispensary, on June 24th, 1875. She was then 5 years old, and resided in Brooklyn. Her father died of pneumonia seven months prior to my examination of the child. He had been a healthy man, by occupation a book-keeper. The mother, who came with the patient, was apparently in good health, but had been subject to attacks of acute rheumatism. The patient has four brothers, all in good health, and one sister "in delicate health." One sister died at eighteen months, of acute hydrocephalus. No hereditary disease on either paternal or maternal side. Joint disease and phthisis unknown in the family history. Upon asking the mother if she knew of any cause for the disease, she stated that she did not. No fall or injury, save the one noted below, known. The history developed was as follows: On the 11th of October, 1874, the patient was playing with her brothers as usual. The next day she limped, complained of "cramps" and pain in the limb. She refused to stand on her leg. In a few hours she was walking around again. From this date to Christ-

mas of the same year, she did not limp when she walked. She had no pain during the day, but at night she would sometimes cry out suddenly, and if, on these occasions, the patient was thoroughly awakened, so that the cause of the crying might be ascertained, she would complain of pain in her thigh and knee, especially if the limb was moved. About Christmas she "caught her foot in the bannister," as she came down stairs. The injury was very slight, and the mother attached but little importance to it at the time. The patient cried, however, and complained of her leg and joint. She commenced to limp the next day, and soon after "a pain in the groin" developed. The symptoms now seemed to demand attention, and the mother sought medical advice at a dispensary. A "sprain or growing pain" was diagnosed. Different remedies, domestic and otherwise, were tried until February 25th, 1875, when a Brooklyn surgeon recognized the difficulty, and applied Buck's extension. From that time to the day the patient applied at the Orthopædic Dispensary, she had been kept in bed. The condition of the patient when she applied was as follows: delicate looking, quite anæmic; not well nourished. Dentition regular. Has had none of the diseases incident to childhood, except whooping-cough. The thigh was flexed and adducted, and the joint was very painful on slight motion. Marked atrophy of gluteal muscles on affected side, Obliteration of gluteo-femoral crease. The muscles of the thigh were atrophied also, and the reflex muscular spasm marked. Fluctuation not present. Limbs of equal length.

The patient did not return to the Institution for treatment. An instrument was applied by the family physician in Brooklyn. The mother states that the child grew gradually worse. On October 17th, of the present year, the patient again applied at the Orthopædic Dispensary. Her condition at that time is thus recorded: Very pale and somewhat emaciated. The face shows traces of suffering. The thigh flexed at  $90^{\circ}$ , and adducted at about

30°. Reflex atrophy and contraction very marked—the muscular spasm being so great, that ankylosis is simulated. Temperature 100.5°. Affected limb one inch shorter than its fellow. No pus had formed during the two years that had elapsed since the child was first brought to the Dispensary, or at least none could be detected. Abscess prognosed—child to enter the hospital.

This case illustrates an important point. Obscure symptoms existed before the traumatic element appeared. This, though slight, marked the onset of the more generally recognized symptoms, which might, by many, be deemed those of actual invasion. The disease had been slowly but surely progressing for an indefinite time, and the slight injury received was sufficient, in the peculiar condition of the joint, to produce an effect in no way commensurate with the cause. In my own experience, this is the kind of traumatism which "produces" chronic joint disease.

A brief comparison of the cases of Lucy H., and Alice Dormer will be instructive. In the former there existed a hereditary history that was unfavorable. The lesion was idiopathic, dependant on exposure, partook wholly of an acute character, and terminated favorably. The latter, while pale and anæmic, gave no history in a hereditary sense that was questionable. She was not, however, the victim of traumatism, but nevertheless developed a progressive articular osteitis (epiphysitis) which, in two years, had produced shortening of the femur to the extent of one inch, marked muscular atrophy and spasm, great deformity, and suppuration, if it has not already taken place, is likely to occur at any time. The best result that can be anticipated in this case, is a shortened, atrophied limb, with an ankylosed joint. It is possible, should prolonged suppuration occur, that the history may end with amyloid degeneration, and death.

Through the kindness of my colleague, Dr. James L. Little,

I have recently had the opportunity of observing critically, a very interesting and rare case, occurring in his service at St. Luke's Hospital, the history of which will further illustrate my belief that traumatism is not an important factor in the production of chronic joint disease. I append the history of the case, accompanied by notes made personally at the frequent examinations, to which I subjected the patient.

Edward Gibbs, aged 5, entered St. Luke's Hospital October 4th, 1877. Hereditary history: Maternal grandfather died of phthisis. Paternal side, good, so far as known. Father died from an injury. Mother of patient a thin, anaemic woman, who has been gradually failing in health since the birth of patient. Has lost flesh during the last two years, during which time she has had "a bad cough." The boy in appearance is not strong; has flabby skin, weak eyes; is pale and poorly nourished. Has had measles and whooping-cough, and has recently passed through a prolonged attack of intermittent fever developed in Indianapolis. Has been free from the fever about six months.

On the 23d of September last, the patient fell backward from a wagon in which he was playing, and sustained a severe injury to the hip, which was accompanied by deformity and pain. After a day or two of domestic treatment, (the child was boarding at the house of a stranger,) and several consultations with physicians, none of whom recognized the difficulty, the child on October 4th, as above stated, was taken to St. Luke's Hospital. Dr. Little found the head of the femur dislocated upon the dorsum of the ilium. The dislocation was reduced by manipulation under ether. On the day following I saw the patient and examined him. There was considerable tenderness about the joint, the movements of which were limited by the pain inflicted. The patient walked with a very evident limp, but complained of no pain in doing so. No rigidity or stiffness marked his gait, and no hesitation was manifested in placing

the foot to the floor. His attitude was not unlike that which might arise from a bruise to any part of the limb. Further examination postponed.

Oct. 15. The boy has been moving about the ward at his own pleasure for the past few days, and has daily improved in walking. Examined to-day, especially to ascertain the character of the muscular resistance, and the condition of the joint as regards pain. Patient placed in supine position, and pelvis grasped and steadied with left hand. *Flexion* of thigh slightly resisted ; motion nearly normal. With the knee flexed, *rotation inward* gave pain. Motion limited, pain acute, finding expression orally. No reflex muscular spasm, such as is found in chronic joint disease, present. Contraction not persistent. *Abduction* and *adduction* slightly impeded. In prone position, pelvis steadied with left hand. *Extension* resisted quite markedly ; not a quick, apprehensive spasm, but a semi-voluntary, elastic, muscular resistance, followed by an exclamation, "Oh !" Flexing the leg at an angle of  $90^{\circ}$ , with the thigh in the above position, and using the leg thus flexed as a lever to produce *rotation inward*, the same result was obtained. Motion limited, the foot passing through the arc of a circle of about  $25^{\circ}$ . *Rotation outward*, markedly limited. Patient sleeps well. Has no pain as he plays about the ward.

Oct. 20. Symptoms have all improved. The same tests as above show improved motion, less pain. Patient *runs* about ward without perceptible limp.

Oct. 21. Case seen by Dr. Buckminster Brown, who visited the hospital with me, and attention was called to the history and condition of patient. The slight remaining resistance to joint motion was developed, and noted by Dr. Brown.

Oct. 27. Gluteo-femoral crease, which had been slightly lower on affected side, normal. No flattening of natis. Severe concussion to sole of foot produces no pain or flinching. No atro-

phy; faradic reaction of the thigh and gluteal muscles normal.

Nov. 24. Very slight, hardly perceptible muscular resistance. Patient runs, jumps, and plays without the slightest limp or complaint.

Dec. 11. Joint motion normal. Patient discharged, cured.

The lessons taught us by this case are both interesting and important. 1. Without a history of dislocation, the condition made evident by examination would have been well calculated to mislead many in diagnosis. In other words, a condition approximating that induced by the injury received, though excited by a less marked traumatic cause, might have been called "incipient hip-disease," and treated as such by, perhaps, extension apparatus, and in a few weeks the patient would have been "cured," when, as the result abundantly proves no such treatment was required. 2. None of the symptoms especially characteristic of the first stage of a chronic joint lesion were present. 3. At no time subsequent to the reduction of the dislocation, was there any disinclination to walk, or hesitation in using the limb. 4. The peculiar and expressive reflex *spasm* of the muscles was absent, though, as in the "hysterical joint," there was a semi-voluntary muscular resistance, which simulated it. 5. The "swift atrophy of the muscles" mentioned by Paget, as following acute synovitis, was not present, nor was the faradic contractility of the muscles reduced. 6. An extensive, (and a neglected,) traumatic lesion of the hip-joint, in a poorly nourished child, with a very questionable hereditary history, steadily improved from day to day, without any especial treatment, and recovery was rapid and complete. To conclude, we may say that the head of the femur had been dislocated for ten days, and that the capsule of the joint was undoubtedly lacerated and the ligamentum teres ruptured. The patient was only 5 years old, and as likely to develop chronic joint disease as any child that might receive some slight, and al-

most unnoticed, injury, which months afterward is followed by the chronic joint limp that so frequently precedes suppuration, &c. It was, however, a simple, acute, local lesion and repair took place rapidly. But all the conditions that are ordinarily deemed necessary to excite "joint disease" were present, if traumatism alone could develop it in this particular case. The child was even given the opportunity to irritate the joint by all the exercise he wished to take, which was very considerable. On the other hand, a simple fall, unattended by any especial feature and antedating, in many instances, the initial expression of the local symptoms several months, is frequently made responsible for so grave and so serious a lesion, as chronic joint disease. Unfortunately, especially for our patients, traumatism alone is not responsible for chronic joint disease. If it were, rapid and complete recovery would be the rule,—abscess and progressive deformity the exception.

In treating more directly of the pathology of joint disease, I wish rather to view it from a practical and clinical standpoint, as I have its etiology, and as furnishing indications for treatment, than with the object of contributing an essay upon its minute morbid anatomy. Indeed I have nothing to add to the researches of the able investigators, whose contributions to the pathology of joint disease leave but little to be said. Brodie, Barwell, Paget, Billroth, Volkmann, and many others, may be consulted by those who wish especially to study this subject. It is enough for us to know that, for obvious reasons, but few opportunities have been afforded pathologists to record the *initial* changes which occur in the chronic forms of articular disease. The cases on record demonstrate, however, that the primary lesion may occur in almost any of the articular structures, and the facts thus adduced do not, as yet, afford sufficient evidence upon which to base reliable data. Hence it is that we find such a variety of opinions expressed by different

surgical authorities regarding these changes. From a clinical standpoint, however, it matters but little where the initial lesion takes place; for in those conditions where chronic joint disease is easily excited, the morbid process sooner or later attacks the neighboring structures, and if it proceed unchecked, the entire joint becomes involved.

An opportunity has been afforded me, through the kindness of Dr. Robert Abbe, to examine the pathological condition of a hip joint, one of the structures of which had become the seat of inflammation in a very peculiar manner.

J. Bruce, aged 30, was, on March 2d, 1875, admitted to St Luke's Hospital, during the service of Dr. James L. Little. The patient was suffering from an aneurism of the femoral artery, for the relief of which Dr. Little ligated the external iliac, on March 9th, 1875. On the 22d day the patient died from exhaustion. While performing the autopsy, and in removing the aneurismal tumor, Dr. Abbe accidentally incised the capsule of the hip joint. A few drops of pus followed the incision. After excising the aneurismal sac, a further exploration of the joint revealed the fact that the ligamentum teres had been the seat of acute inflammation. Its surface, highly injected, was of a brilliant scarlet color. About two drachms of laudable pus was found in the capsule. There was no evidence of disease of the cartilage or bone, and the other joint structures were sound. The patient had complained before the operation of pain in the knee, and the thigh was flexed and adducted to a considerable extent. The presence of the aneurism and the pressure it occasioned upon the subjacent parts, were sufficient to account for both the pain and position of the thigh, and no one had suspected the existence of any hip joint lesion. It would not have been discovered, but for the accident referred to, which disclosed the product of inflammation. Regarding the cause of the lesion thus found, it would indeed be difficult

to offer a perfectly satisfactory explanation. The tumor did not in any way press upon the joint : if it had we should have looked for a lesion in a different structure. There was no history of direct violence. The limb had been held prior to the existence of the pain in the knee, &c., for many weeks in a *flexed* and *adducted* position. This placed the ligamentum teres upon the stretch, and in this way an irritation was produced that might easily be sufficient to produce the inflammation. This is my explanation of it, and it involves a traumatic cause. The evidences of acute inflammation, and laudable pus—each one (where suppuration ensues) the ordinary result of traumatism—were found at the autopsy.

I do not mention this case as forming the basis of my opinion regarding the early changes which occur in joint disease. On the contrary, my clinical observations, records and studies lead me to different conclusions. I offer this interesting case as a contribution to the, as yet, very incomplete literature of the subject.

While no opportunity, other than the case just mentioned, has been afforded me to examine, the post mortem condition of a diseased joint in the *earliest* stage of the lesion, I have, by watching the development of the symptoms, and noting their sequelæ, in well marked and unmistakable cases, and in obtaining reliable histories from intelligent persons, reached conclusions that are based upon, strictly speaking, clinical experience. It is from this standpoint that I submit my views, selecting such cases as may illustrate the points involved, and stating in general terms the results of my observations, which include the records of several hundred cases that have been under my personal care, both in dispensary and private practice. My personal experience with statistics forbids my presenting them. In joint disease especially, they are of value principally to the compiler, so important are the many modifications

of the facts elicited and which cannot be expressed in a few words. Statistics are valuable in reporting results, and in classifying absolutely certain facts, such as sex, age, &c., &c. But beyond this, with no universally accepted definition of the many headings necessary to complete a history, statistical tables on joint disease are, at least, unsatisfactory. I have the records of many cases. Instead of presenting tables, I prefer to state my conclusions.

Of the various structures entering into the formation of those joints which are most frequently the seat of disease, the bone and synovial membrane are the most liable to inflammation. The ligaments, from their intimate association with the synovial membrane, are so closely identified with the latter, that it is practically impossible to diagnose an idiopathic lesion of the former. The cartilage, being non-vascular, is rarely, if ever the seat of an idiopathic inflammation; but when, through traumatic cause it becomes injured, serious trouble is apt to ensue. We have then, practically, these two important structures—the bone and synovial membrane, to which we must look for our primary lesion : or, perhaps we will state the case more clearly if we say that in whatever part of the joint the primary change may take place, it is to one of these essential joint factors to which we must look for our symptoms. The early symptoms of either chronic osteitis or synovitis are, generally, clearly defined, and though, as the morbid process advances the distinctive symptoms may become obscure and conflicting, there are, as I shall hope to demonstrate, certain specific indications which are of value as a means of making a differential diagnosis, and upon which, of course, will depend both our prognosis and treatment.

In chronic synovitis, "we first find swelling and redness of the synovial membrane ; it has already undergone some change in the lateral portions of the joint, in the folds and neighboring

sacs ; its tufts are puffed up, very little elongated, but very soft and succulent ; the whole membrane is more readily distinguished from the firm tissues of the capsule, and may be detached with greater facility than normally. At this time the synovia is rarely increased, but is cloudy or even resembles muco-pus. These changes in the synovial membrane gradually increase ; it becomes thicker, more œdematos, softer, redder ; the tufts grow to thick pads, and in places resemble spongy granulations. The surface of the cartilage loses its blue lustre, though it is not yet visibly diseased : but the synovial out-growths begin to grow over the cartilages from the sides, and to push in between the two adjacent surfaces of cartilage ; meantime the capsule of the joint is also thickened, and has acquired an evenly, fatty appearance, and is very œdematos ; this swelling and œdema gradually extend to the subcutaneous tissue, and to the skin. From this point, the changes in the cartilage claim most of our attention. The synovial proliferations, in the shape of red granular masses advance gradually over the entire surface of the cartilage, and cover it completely, lying over it like a veil ; if we attempt to remove this veil, we find that in some places it is attached quite firmly by processes entering the cartilage, just as the roots of an ivy vine cling to and insert themselves into the wall against which it grows ; these roots not only elongate, they spread out, and gradually eat up the cartilage, which, when the covering of fungous proliferations is removed, appear first rough here and there, then perforated, and finally disappear altogether ; then the fungous proliferation extends into the bone, and commences to consume this ; the result is fungous caries." (Billroth's *Surg. Pathology*, page 473.)

I have quoted thus at length from an eminent authority upon the progressive changes which occur in chronic synovitis, for the purpose of calling attention to some of the important symptoms following and accompanying this condition, as it

passes through its various stages. This description does not include hydrops articuli, which, as the same authority states "is no more apt to become purulent synovitis than is chronic articular rheumatism."

In the early history of this pathological condition, there may be some pain of an indefinite and vague character. Sometimes there is no pain at all. It does not at least exist as an important symptom, and it is most likely to be developed after prolonged exercise. In my own experience it has never been urgent, sleep being undisturbed by "starting pains," and the incoherent, nocturnal cry. A slight swelling may be noted, principally exhibiting itself, for instance, in an obliteration of the fossa on either side of the patella, if the knee be the location of the disease. The patient is apt to limp slightly, especially after exercise, and the limp thus developed is usually the first symptom noted. No pain being present to locate the trouble in the mind of the parents, and the patient sleeping well, the limp is usually supposed to be a "bad habit." The limp increases, the swelling becomes more apparent, the joint begins to assume a semi-flexed position; pressure over the articulation develops sensitive points. The patient now locates a definite pain, and it is usually at this stage, especially in dispensary practice, that professional advice is sought. The changes in the synovial membrane and the modified secretion resulting therefrom, do not produce an effect which limits the motion of the joint, except in the extremes of movement. The resistance felt in gently urging the distal member of the joint into a position of extreme flexion or extension is not unlike that which would result from a simple distension of the capsule, or the altered and thickened state of the synovial membrane. There is no sudden, apprehensive arrest of motion, caused by a quick, spasmoid contraction of the flexors on the one hand, and the extensors on the other; in other words there is no reflex

muscular spasm which arrests movement at a given point, with a quick and decisive check ; or, if this muscular spasm exists at all, it is only to a very limited extent. As the disease advances however and the fungous proliferations fairly invade the bone, this muscular spasm occurs to a marked degree, and with it other symptoms appear which will be described later on.

In primary, chronic articular osteitis, on the other hand, which is only too likely to end in caries, the pathological conditions are of a far different character. The lesion involves, to a greater or lesser extent, the epiphysis of one, or very rarely two, of the important bones which form the articulation. It is however, like the condition described above, viz,—*chronic*, and it may have existed, in a sort of latent state for many months, wholly unsuspected, and at a point not immediately contiguous to the articular cartilage. It would certainly seem that this might be true, for the symptoms, once fairly developed, progress as a rule slowly, but with great persistency, and they are very difficult to control. Remission in the symptoms also, is more apt to occur in chronic osteitis than in chronic synovitis. I saw to-day a case—John Reading, aet.  $3\frac{1}{2}$ , where vague and uncertain symptoms existed all last Summer, He was a little lame at that time, was very restless at night, complained of pain in his hip and knee, and was decidedly disinclined to take exercise. These symptoms all disappeared about September 1st. They again appeared in a couple of weeks, this time accompanied by an inguinal adenitis. Again the child recovered, and ran about without any limp. To-day, (November 22nd), this patient, when examined, though limping only very slightly, was found to have a decided reflex spasm of all the important muscles acting on the hip-joint, very limited joint motion, shortening of the limb (a full quarter of an inch,) marked atrophy of the muscles of the thigh, which

was nearly an inch smaller in circumference than the sound side, and a reduced faradic contractility of the quadriceps extensor and gluteus maximus. The circumference at the calf was the same on either side. But actual pathological observations are wanting on this point, and it is only by calling physiology to our aid that we can reach satisfactory conclusions. In the epiphysis of the long bones, the nutritive processes occur upon which depends the growth of the diaphysis.

These epiphyses are very vascular as compared with the dense structure of the shaft, and they are, of all the joint structures, the most abundantly supplied with nervous tissue. Kölliker remarks\*: "On the articular ends of many bones, such as those of the elbow, knee and knuckle joints, I have noticed the nerves to be more abundant than elsewhere." Again, (page 338), "In the knee I have seen nerves, even in the true synovial membrane, although in general they are rare, and are most distinct in the large vascular processes." In children these epiphyses are in a condition that approximates hyperæmia; and in that peculiar state which predisposes to chronic joint disease it would seem that their true physiological function was sluggishly performed. I cannot do better in this connection than to quote from Mr. Barwell's excellent treatise on "Diseases of the Joints": "The truth is, that the nutritive activity brought about by the ossifying action in the epiphysis, is very apt to produce a congested condition of the part; and the large bone ends which are found in strumous children are the accompaniment of such tendency to congestion. As the child gets older and stronger, this hyperæmia disappears, and in the great majority of instances is followed by no evil results whatever. It is, however, certain that in a given number of cases the congestion predisposes to inflammation, and the merely passive is followed by an active condition. Thus inflam-

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\* Manual of Human Histology, Syd. Ed. Vol. I, p. 335.

mation may be set up in an epiphyseal end which was previously in an abnormal state, and such in the greater number of cases is the mode in which the disease now under consideration (strumous articular osteitis) commences. All such attacks are in the beginning very slow, and hang for months, perhaps even years, between a state merely of sluggish functional performance and of active disease." My clinical experience fully sustains this last sentence, and indeed, the entire quotation. When this "sluggish functional performance," the initial stage of chronic articular osteitis, terminates in "active disease," the first symptom noticed by the parents will not be pain but, as in chronic synovitis, a limp. In this one respect the two conditions present the same symptom, though the limp of chronic synovitis resembles that of simple joint fatigue, while that which occurs in articular osteitis is more strictly a debility of the entire limb. Indeed, all the symptoms in chronic articular osteitis, from the very onset, show the marked reflex impression which the disease makes upon the nervous system, while those of chronic synovitis are more strictly *local*. These facts, which, so far as I know, have not been noted before, are not difficult to explain when the neural distribution to the two structures, and the conditions described by Charcot, in his work on "Diseases of the Nervous System" as being necessary to produce trophic changes and muscular spasm, are considered.

Sometimes quite early in the history of articular osteitis there occurs this peculiar, incoherent cry at night to which I have referred already as resembling, in some respects, that which occurs in acute hydrocephalus. I have heard it frequently in chronic joint disease when it was very agonizing. The fact, however, that it rarely awakens the patient, and that if he be awakened he knows or remembers nothing of it, leads me to believe that the irritation of the peripheral epiphyseal nerves is both peculiar and profound—for this reflex expression of the lesion

occurs during the suspension of the will. Then there is the characteristic reflex spasm of the muscles, a spasm which resembles in many important respects that which follows the remote symptoms of injuries of nerves, as described by Dr. S. Weir Mitchell in his valuable treatise.\* Accompanying this reflex spasm is a muscular atrophy not dependant upon *disuse*, which is pronounced and which can be demonstrated by the faradic current. And many of the skin troubles which follow during the local treatment of this lesion, and which have been referred, and which are partly due, to the irritating properties of the adhesive plaster, etc., I have sometimes thought were the analogues of the glossy skin and eczema found after neural lesions. I have not time here to amplify this interesting study. I have already stated my views in brief upon this subject.† I wish, however, to take this occasion to say that I am indebted to my friend, Dr. E. C. Seguin, for his kind assistance and advice in my investigations.

To return to the symptoms of articular osteitis : The debility of the limb increases gradually, and diurnal pain is, as a rule, first developed by any sudden or unexpected twisting of the limb. Even a very slight movement, for which the patient is unprepared, will cause him to cry out. The "starting pains" accompanied by the osteitic cry become in many instances urgent. The muscles acting upon the articulation, when the joint is examined, show a decided tendency to resist, and a marked spasm (it is more than a "contraction") of the muscles arrests the motion at a given point. In the first stage the resistance may be only felt in the extremes of motion ; unlike the sensation imparted when the resistance lies in a thickened or distended capsule, it has a peculiar, apprehensive quality. It is sharply defined, and no effort on the part of the surgeon or patient can

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\* Injuries of Nerves, by Dr. S. Weir Mitchell. pp. 147-153.

† Op. cit.

overcome it without the use of an anæsthetic. These conditions are best noted in the knee-joint, where an effusion, or a thickened capsule is readily observed, and the existence of muscular spasm easily detected. In illustrating these points I will select two cases of knee-joint disease, both of which are under my observation now in private practice.—

Addie D——, aged five and one-half years ; hereditary history shows phthisis on maternal side ; child strumous in appearance, waxy skin, etc. Has had very little illness, except that incident to childhood. Was seen in consultation with Dr. S. W. Dana on July 9th, 1877. At that time the following history was obtained : Last December (1876) the patient complained slightly of her knees, but the trouble was not severe enough to interfere with the patient's health or movements. No swelling was noticed by the parents, nor was the case considered urgent enough to demand the attention of the family physician. A few days before Dr. Dana brought the child to my notice, he had been called in by the father on account of a swelling which had been observed in *each knee-joint*. An examination proved the existence of a very considerable effusion in either joint, accompanied by an evident local rise of temperature, but with no constitutional disturbance. No pain was produced by movement of the joints, by pressure, or concussion. The child could run and play without inconvenience, limping, or pain. It is not unlikely that limping would have been observed had only *one* joint been affected. Passive movements of the affected joints developed no reflex muscular spasm whatever ; an *elastic resistance* limited joint motion in the extremes of flexion and extension. No pain or discomfort at night ; no "starting pains ;" patient sleeps soundly ; no perceptible muscular atrophy. *Diagnosis*.—Chronic synovitis affecting each joint. The bone was excluded from any participation in the disease. As to whether the cartilages were affected is uncertain ; probably

they were slighty on their articular aspects. Looking forward for an indefinite time, and supposing that the disease proceeds unchecked, both cartilage and bone will become involved, and when the latter has been fairly invaded by the disease, there will occur the sharp nocturnal cry, the reflex muscular spasm, and the other symptoms which I have described as pertaining to articular osteitis.

Willie L——, aged four years, applied at my office on September 11th, 1877, with a letter of introduction from Dr. E. D. Hudson, Jr. The patient had been suffering from a chronic disease of the knee-joint for two years. The leg was flexed at an angle of  $90^{\circ}$  with the thigh, and the head of the tibia had become partially subluxated backward. An examination of the joint revealed a smooth and glossy skin drawn tightly over the joint. No fluctuation was anywhere evident; no apparent thickening of the capsule. The ham-string muscles were very tense, and upon careful examination no motion whatever of the articulation could be detected. The joint was practically ankylosed by the muscular spasm; the tendon of the quadriceps femoris being equally tense with the flexors of the leg, and resisting any attempt at motion. That the joint rigidity was due to muscular action alone, was demonstrated by the administration of an anæsthetic, free motion being then easily developed. The muscular atrophy was also great, and the reflex spasm marked, and excited upon the slightest attempts at motion. Nocturnal pain had been a prominent symptom, accompanied by sudden cries and incoherent mutterings at night. *Diagnosis.*—Osteitis, affecting probably the articular aspect of the epiphysis of the tibia, and *prognosis* unfavorable, including a possible suppuration, a partial arrest of development of the tibia, and ankylosis.

To bring out plainly the symptoms characteristic of these two conditions, I will analyze the important symptoms of

each and place them side by side in a differential table:

**CHRONIC SYNOVITIS.**

1. Capsule thickened,—Effusion marked.
2. Natural contour of leg and thigh,—Joint outline obliterated.
3. Motion extensive and nearly normal.
4. Resistance to motion *elastic*, and efforts to overcome it not productive of pain.
5. No reflex muscular spasm present.
6. No pain present, nor produced by forcible tests.
7. No perceptible limp or hesitation in walking.
8. Sleep normal,—No reflex osteitic cry.
9. Femur and tibia in normal relation to each other.
10. Symptoms local, so far as those *dependent* on the joint lesion are concerned.

**CHRONIC ARTICULAR OSTEITIS.**

1. No thickening of capsule evident,—no sense of fluctuation.
2. Muscular atrophy marked,—Joint outline clear and distinct,—Joint appeared large, on account of the diminished size of both thigh and leg.
3. Motion *nil*.
4. Joint held perfectly rigid by muscular action alone.
5. Reflex muscular spasm affecting both flexors and extensors.
6. Acute pain upon the slightest attempts at joint motion.
7. Unable to walk from pain and deformity.
8. Incoherent cries and "starting pains" occurring during sleep.
9. Tibia subluxated backward (partial) by muscular action.
10. General and local neural symptoms directly referable to the joint lesion.

A further comparison will be unnecessary. Sufficient is here stated to plainly indicate the essential points involved. *Chronic synovitis*—and especially the fungoid variety—is not, in my experience, attended by reflex muscular spasm to any considerable extent. On the other hand, in *chronic articular osteitis* this spasm is an early and progressive symptom, which gradually increases until ankylosis is simulated. My experience also leads me to the conclusion that the initial lesion occurs more frequently in the epiphysis than in the synovial membrane. Either this is especially true of the hip-joint, or the chronic synovitis remains undiscovered until the morbid process, attacking the bone, gives

rise to the characteristic symptom of articular osteitis, viz., the reflex muscular spasm. Such a condition of the hip-joint, for instance, as that which affected the knees in the case of Addie D— would certainly have remained undiscovered many months, for it was not until the effusion was observed that any trouble was recognized by the parents. It is much more probable that the synovial membrane is more frequently affected in the knee-joint (this is certainly true of acute synovitis) and that the epiphysis is oftener attacked at the hip. I do not remember to have observed more than two or three cases where I was able to diagnose a fungous synovitis of the hip-joint. In one of these cases the mother of the patient (James Morrow) did not apply to the dispensary (Dec. 20th, 1876) with any thought that a joint disease existed. There was merely a slight and almost imperceptible swelling in the region of the capsule of the hip-joint to which my attention was invited. The history of the boy developed, however, uncertain and vague symptoms of several months' standing, which pointed to the hip-joint—which symptoms had all disappeared upon the appearance of the swelling above referred to. Examination of the articulation developed marked reflex muscular spasm in the extremes of joint motion. The patient could run without a limp. He jumped from a chair without favoring the suspected limb. He could even hop on the affected side with perfect ease. But for the existence of the characteristic reflex spasm and the limited motion (there was no pain, nocturnal or diurnal) I should have thought there was some extra capsular trouble simulating joint inflammation. But this spasm was marked. It was chiefly noted in rotation, both inward and outward, and it possessed all the characteristics of the peculiar resistance which accompanies articular osteitis. After some study, I made a diagnosis of chronic fungoid inflammation of the synovial membrane which had existed for some months, and which was then invading the

bone. With this opinion, an extension instrument was applied. The stiffening of the joint became rapidly progressive. This result did not surprise me; on the contrary it served to confirm my diagnosis, for I have frequently observed that in fungous synovitis of the knee-joint, where tolerably good motion existed, that an immobilizing apparatus rapidly stiffens the articulation. I believe this rigidity results from the fixation, and in this way :—When the joint is allowed to move freely, the spongy granulations are, by friction and pressure, kept in abeyance; but when the joint remains fixed in any one position for a length of time, they become exuberant and sensitive, and motion is thus interfered with.

After a time (to return to the Morrow case) the rigidity became so marked that the apparatus was wholly dispensed with, in order to test the effect of a free use of the articulation. For a time slightly better motion was observed. Pain then became an urgent symptom. But in order to test the matter fully the re-application of the splint was deferred. The joint daily became weaker; the muscular spasm grew more persistent; nocturnal starting pains appeared, and the patient, on November 1st, 1877, was unable to walk a single step alone. The limbs at that time were of equal length, the atrophy marked, and a very slight amount of joint motion only was perceptible. Muscular spasm was very marked, and the faradic reaction of the thigh muscles, which from the first had been modified, showed a still greater reduction. Pain could be developed by very limited force, and all the symptoms of "morbus coxarius" were present. A fact, to which I wish to call attention, was the equal length of the limbs at my last examination of the case (November 10th). The history of the disease covers a period of eighteen months. Had the lesion been one of primary chronic epiphysitis, some shortening would have taken place. The splint was applied for the second time about the 5th of Novem-

ber, since which time the subjective symptoms have been modified, pain being less, and sleep better.

I have said that in the first stage of chronic inflammation involving the joints, but little difficulty occurred in making a differential diagnosis between synovitis and osteitis. My reasons for making this statement are evident in the differential table which I have given, and from my remarks. But many cases present where the articulation is not examined until the disease has existed for a long time. The symptoms here may be conflicting. Evidences of synovial disease may be present, and a decided reflex spasm also exist. My rule under these circumstances is as follows: If the various joint movements, be they limited or nearly normal, are unaccompanied by this peculiar reflex muscular spasm and atrophy, I believe the bone to be free from disease. If, on the contrary, motion be equally extensive, even approximating the extremes, and this spasm occur, the bone is involved. *Marked reflex spasm in chronic joint disease always indicates osteitis.* Its absence, I believe, eliminates the bone, as a rule, from any participation in the lesion. There is a class of cases which form an apparent exception to this rule. I refer to those cases of articular osteitis (either primary or secondary) where early and profuse suppuration occurs. In this condition the reflex muscular atrophy and spasm do not seem proportionate to the extent and character of the lesion. These cases have not occurred very frequently in my experience. They seem to accompany the markedly scrofulous diathesis, and are frequently followed by lardaceous degeneration. I shall speak more concisely of this condition on a future occasion. The opportunities I have had of examining diseased joints after exsection or amputation, confirm my position regarding the relation of the muscular spasm to the lesion. I will mention two or three of the most striking cases, in illustration:

Mr. S—— entered St. Luke's Hospital on Sept. 6th, 1876, with chronic disease of the left knee-joint of several years standing. The limb had become, in consequence of the diseased articulation, a source of much annoyance and trouble to the patient, and various efforts had been made, but without success, to afford relief by conservative measures. A very considerable degree of joint motion existed (to exceed 90° of flexion and almost perfect extension). A very perceptible and distinctly audible cartilaginous crepitation existed on passive movement. There was no marked nocturnal pain however, and no decided reflex muscular spasm. It existed, however, slightly. In October, 1876, Dr. Little amputated at the lower third of the thigh. Examination of the joint revealed the characteristic appearance of a fungous degeneration of the synovial membrane in an advanced stage, and the eroded and roughened cartilage had a worm-eaten aspect. The capsule was filled with a pulpy mass of unhealthy granulations, which had invaded the ligaments. The bone was not carefully examined. I should infer that it was slightly diseased, and probably in the head of the tibia. This case is cited to demonstrate that an extensive degeneration of both the synovial membrane and cartilage are compatible with a considerable degree of free and unrestricted motion of the articulation.

Maggie Quinn entered St. Luke's Hospital on Dec. 17, 1875. The patient had sustained an injury of a very uncertain character some six weeks before her admission, which the mother stated had been followed by obscure symptoms about the joint. When examined the motions of the limb were nearly normal, but pain and marked reflex muscular spasm were developed in the extremes of movement, especially when, with the patient in the prone position, and the leg flexed upon the extended thigh, rotation outward or inward was attempted. The child walked with a decided limp, and already a considerable degree of muscular

atrophy had occurred. The muscular spasm increased rapidly, and in three months the joint was seemingly ankylosed. The incoherent nocturnal cry occurred soon after her admission. An extension splint was applied about the middle of January following. An incontinence of urine developed, however, which materially interfered with the perineal straps, and excoriations followed which refused to yield to treatment. In June, 1876, my colleague, Dr. T. T. Sabine, excised the hip-joint. The bone and cartilage were found diseased, and the synovial membrane was, so far as could be ascertained, only slightly affected. I do not remember to have seen a more rapidly progressive or a more persistent reflex muscular spasm than was developed in this case. The pathological specimen obtained sustained my expressed opinion that the primary lesion existed in the bone.

A peculiar circumstance was developed in the after history of this case. Neither the nocturnal osteitic cry nor the reflex spasm of the muscles ceased after the operation. They both existed irregularly, subsequent to the exsection. I forgot to state that the acetabulum was found to be diseased.

This case, operated on so early in its history (a little more than six months after the first appearance of the symptoms), was deemed by me a favorable one for exsection. I regret to add that the sinuses are still unhealed, and that albumen has lately been discovered in the urine.

John Buchanan, aged 3 years, applied at the Orthopædic Dispensary on May 22d, 1877, with extensive disease of the right knee-joint. About one year before, his parents had noticed that the patient limped a little—"dragging the limb." No pain was noticed during the day, but at night the patient would "scream out in his sleep." No swelling of the joint was noticed until after the limp and the nocturnal pain. When the limp appeared the joint commenced to stiffen and to gradually flex. The slightest movement at this time produced very severe pain.

It was with difficulty that the mother could put on the patient's shoe and stocking. The muscles began to waste, and the "stiffness" of the joint became a marked symptom—progressing until no joint motion was apparent. In December following there was a marked increase of the pain. High fever supervened, and the patient began to lose flesh rapidly. Swelling of the joint now occurred. When he applied at the Dispensary the joint was much enlarged, the tissues surrounding it being thickened and infiltrated. Two sinuses led down to the joint, one above the patella, the other below and to the outer side. An abscess existed on the anterior and outer aspect of the thigh, at about the junction of the middle with the lower third. The muscles of the leg and thigh were greatly atrophied. Any attempt at joint motion produced excruciating pain, and a marked reflex spasm of the muscles existed. The patient was very much reduced in flesh. On May 28th, after consultation with Drs. Markoe, Peters, and Sabine, I amputated just above the abscess, using the abscess wall for the outer flap. The patient recovered rapidly. Examination of the joint revealed the fact that the lesion primarily existed in the head of the tibia, where a cavity was found in the internal tuberosity, involving almost all of that portion of the epiphysis. In the cavity was found a sequestrum as large as a good sized pea. Free communication existed between this cavity and the joint, the cartilage being perforated. Pus had thus found its way into the articulation, producing complete joint disintegration. The condyles of the femur were not involved, a slight erosion only existing on the articular cartilage of the internal condyle. Comment upon this case is, perhaps, unnecessary. I will merely call attention to the initial lesion, which was followed by the early stiffening of the joint, the muscular atrophy and spasm, the absence of swelling, and the osteitic cry, all of which existed before the epiphyseal abscess found exit in the cavity of the joint.

In conclusion I wish to call attention to this peculiar muscular spasm in chronic joint disease. It would be a difficult matter to describe it in such a manner that it would be recognised. Like the physical signs in thoracic disease, its peculiar qualities are best acquired by clinical study. I shall attempt to describe it when I speak of the symptoms of joint disease, in detail. I have elsewhere stated that I believe this spasm to be due to an irritation or inflammation of the peripheral nerves supplying the joint, and that the spasm thus induced produces the various progressive deformities in joint disease.\* Without anticipating what I shall say upon this subject on some future occasion, I may remark that further investigations have only strengthened the position I take in the article referred to. That the trophic changes occurring in joint disease, and the reflex spasm which accompanies it, are due to the same cause I have no doubt. Billroth remarks: "The extent to which the muscles sympathize varies greatly; according to my experience the highest grades of muscular atrophy occur in those cases where there is no suppuration of the joints but caries sicca, and where the joint disease seems to proceed from osteitis."† In the paper already alluded to I say, "In chronic osteitis, especially if associated with a chondritis, the contraction is firm, tense, and very persistent. It increases with greater or less rapidity, until ankylosis is simulated. The atrophy is slowly but steadily progressive, and the muscles show a marked decrease of faradic reaction. This is especially the case in the dry osteitis." I had not, when I wrote this, seen the above sentence, quoted from Billroth, else I should have referred to it in my paper. The neural symptoms are so marked in some obscure joint lesions as to be suggestive of a primary spinal cord change, a condition which Dr. S. Weir Mitchell calls attention to in his paper on

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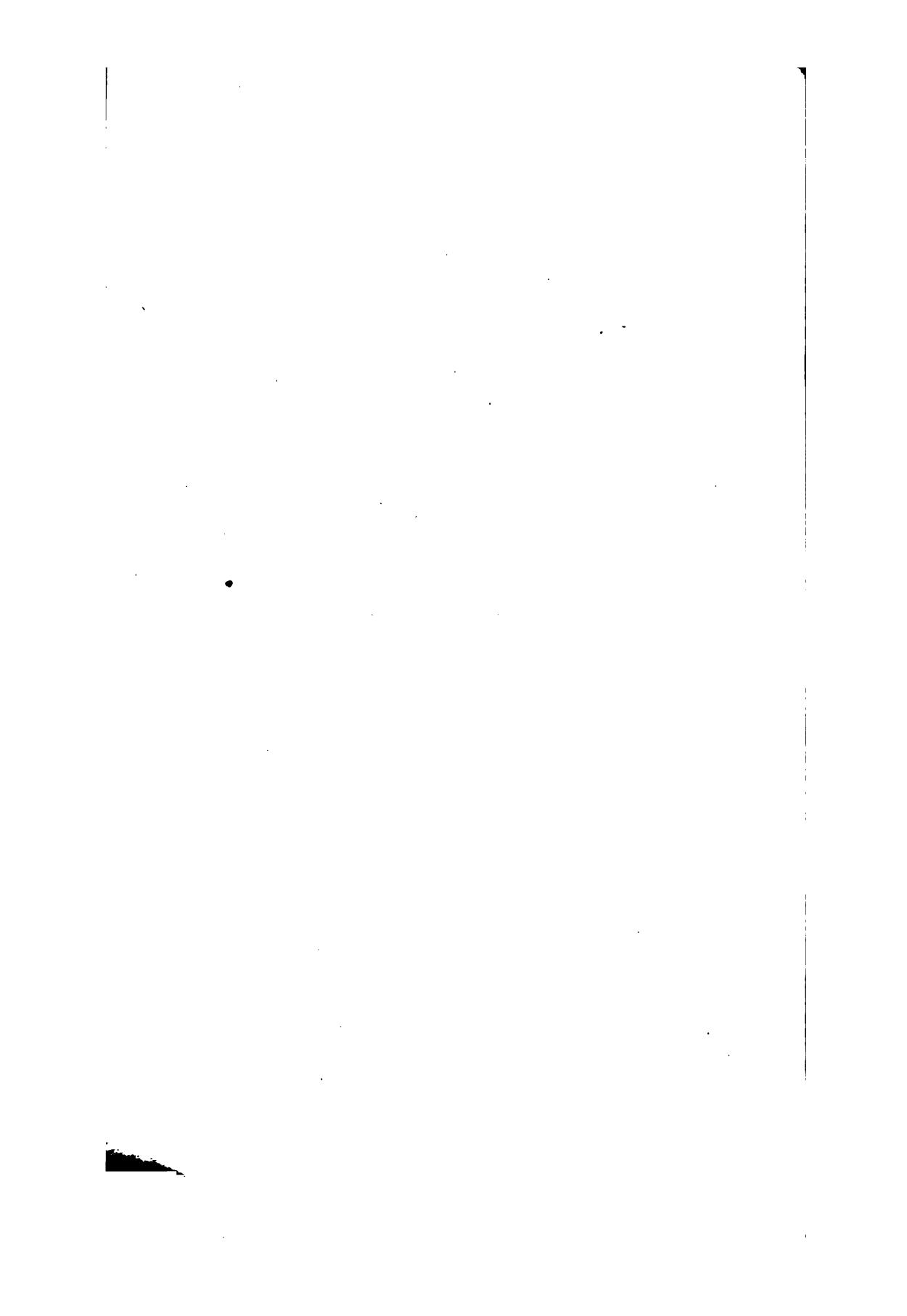
\* Op. cit.

† Op. cit. p. 481.

"Spinal Arthropathies."\* In a letter to me, dated November 5th, he says : "There is a resemblance between the two conditions you speak of," (the muscular spasm and atrophy occurring in joint disease, and that following injuries of nerves), "both sets of contractions and atrophies result from irritative peripheral lesions of nerves, in or out of joints ; and in the joints, as in the nerve trunks, the muscular loss is often out of proportion to the joint lesion, and this especially in the knee and shoulder—the small joints scarcely cause it,—but I fancy that more often than we suppose the joint and muscle lesions are common results of a spinal malady." I have often expressed a desire to subject the spinal cord to a microscopical examination, my thought being that in some of these old cases, where caries sicca had existed for years, some change might have occurred in the cord as a result of the prolonged reflex movement. The cases of spinal arthropathy which I have seen, differ in many important respects from the lesion I have attempted to describe, where, as I believe, the neural symptoms are purely reflex. Hereafter I shall speak more particularly upon this extremely interesting subject, and after studying M. Valtat's monograph, "De l'Atrophie Musculaire Consecutive aux Maladies des Articulations," a recent work, which I have just received from the author.

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\* Am. Jour. Med. Sci., April, 1871. 57, p. 339



## FIBROUS TUMORS OF THE UTERUS.

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GENTLEMEN :—The woman before you, Mrs. S., is a Norwegian, 36 years old, married 14 years, mother of six children. She is stout, ruddy, and muscular, in appearance. Poor, and can command only a scanty supply of the necessities of life ; dwelling in a small, poorly ventilated house of three rooms, which she shares with her husband and six children. As is the case with many women of Norway, she commenced menstruating somewhat late in life—in her seventeenth year. The menses were regular and not remarkable in any respect before she was married. She bore children rapidly, her last being now four years old. At her last confinement, soon after coming to this country, she was not so fortunate as in her previous ones. She had slight hemorrhage almost every day for two months before confinement, and flowed so profusely during the third stage of labor, as to cause great anxiety to her friends. She remembers taking medicine for twenty-four hours to make the womb stop bleeding. Since that confinement her menstrual flow has been greater than before, and during the last year she has had profuse menstruation, and twice severe hemorrhage.

lasting for several days. She also has headache, sense of weight in the pelvis, and constant leucorrhœa. Her appetite is good, bowels regular, and although losing so much blood, has a florid complexion, with full rounded facial lines, and seems to be in the enjoyment of fair health.

You will notice as I expose the abdomen, that the hypogastric, the lower half of the umbilical, and a part of both iliac regions are unnaturally full. Palpation discovers this fulness to be produced by a body apparently globular, but actually large above, and growing smaller towards the pelvis, where, on the right side, there is attached to it a smaller body, about four inches in diameter, and somewhat movable upon the larger one. Both these, parts of one tumor, feel very hard and destitute of elasticity. At the point of junction, there is a deep indentation or sulcus quite easily determined. Aside from this projection, the tumor seems round in contour, although not smooth. Percussion over the whole area mentioned, elicits no resonance, while as you see a resonant zone surrounds it, showing that the intestines are displaced to its sides and rear. You also see that the fingers will depress the abdominal walls so as to define its boundaries in every direction except towards the pelvis, plainly indicating its origin to be in that bony cavity.

When I introduce my fingers into the vagina, as soon as they fairly enter that organ, they come in contact with a solid mass, having the hardness possessed by the tumor above the pelvic bones. If you will notice closely as I push them strongly upward against the vaginal tumor, you may see that the supra-pelvic mass moves. When with the free hand, I move the abdominal tumor to one side or the other, I feel the vaginal part move upon my fingers. I now introduce the sound with some difficulty through the os uteri into the cavity of that organ, it passes backwards and upwards, and about four inches of it goes through the mouth with the concavity forwards. The

handle of the sound, as you see, projects from the vagina and lies between the thighs of the patient. Now if the tumor in the lower part of the abdomen is moved, the outer part of the instrument may be seen to move with it. Whatever direction we make the tumor take, whether upwards, downwards, or sideways, the same direction is indicated by the instrument: it may also, as you see, be made to roll with the tumor. This spontaneous movement of the instrument and the tumor, plainly demonstrates the continuity of the structures of the uterus and the substance of the tumor. From the direction the sound has taken, we know also that it has passed behind the bulk of the tumor, and as we know that the instrument is in the cavity of the uterus, we have no doubt that the tumor is developed in the anterior walls of that body, and we can hardly doubt that it is constituted of two lobes, one large, and situated in the more central part of the substance of the anterior wall, and the other smaller on the right side, in the external layers of the muscular structure of the wall near the peritoneal surface.

If you have followed the different steps of this examination, your diagnosis will be demonstrative of an intramural and a subserous fibroid tumor of the uterus. The cavity of the uterus is elongated to double its ordinary depth, and the tumor being felt low in the vagina, is an evidence that it occupies the whole of the anterior wall from the cervix to the fundus. It remains for me to inform you that the cervix is about its natural length and much increased in size, and the os uteri not larger than natural, and situated an inch or more behind the centre of the pelvic cavity. It is also more than ordinarily near the peritoneum.

Allow me here to recall the case of Mrs. O. N., who came into the hospital one month since. She is a tall spare woman, 40 years of age, and has given birth to nine children—the

youngest 3 years old. During the years she was bearing children her health was uniformly good. When she commenced menstruating, after her last confinement, the discharges were unusually profuse, and succeeded by leucorrhœa. She also, about that time (two years ago) commenced having a sense of dragging in the hips, and a sensation of weight on the perineum. Her bowels became constipated, she experienced difficulty in digestion, her strength failed, she lost flesh, was swollen in countenance, in fact presented the thoroughly miserable appearance you saw soon after she entered the hospital. The hemorrhages of late had been more profuse, and lasted a longer time; her leucorrhœa between the times of bleeding was copious, and mainly consisted of a thick, tenacious, yellow mucous. These symptoms so unmistakably pointed to uterovaginal disease of some kind, as to demand a physical examination. When the abdomen was exposed, the walls were found to be thin and collapsed towards the spine, except at the hypogastric region which was somewhat elevated as by a round tumor, pyriform in shape, that reminded us of the gravid uterus in the fourth month. The tumor was not tender to the touch, and would move quite freely from side to side when properly manipulated. There was resonance over the whole abdominal space, excepting at the tumified part where percussion yielded no sound. We could not as you recollect, elicit any thing like fluctuation, nor hear vascular *bruit*. Upon introducing two fingers into the spacious vagina, the patulous os uteri was discovered a little lower than usual, but otherwise naturally situated. When the tumor above the pubis was moved downwards or sideways, the mouth of the uterus was felt to follow its motions, and by carrying the fingers high up on the sides of that organ, it was found enlarged in every direction. Passing the index finger through the os uteri, it came in contact with a round hard body, which filled up the cavity of the uterus as

far as could be reached. The sound could be passed into the uterine cavity three inches, and be made to traverse about two-thirds of the circumference of the tumor. The included tumor was dense and smooth.

Our diagnosis was sub-mucous, fibrous tumor of the uterus, which was corroborated on its removal.

I here exhibit to you a tumor which was removed, *post-mortem*, from a patient who died of peritoneal dropsy, without ever having been tapped or otherwise surgically treated. You will notice that the uterus to which it is attached, is hypertrophied to the size it would be at four month's pregnancy. The fallopian tubes are greatly elongated, extending from the sides of the fundus. Arising from between these, and continuous with the structure of the uterus, is this enormous globular tumor, quite as large as an ordinary-sized head. During life, this patient had not been subject to more than slightly profuse menstruation. She had not borne children, although she had been married twelve years. She was only 32 years of age when she died.

The diagnosis during life was not difficult. By using the sound and one hand above the pubis, the tumor could be moved in any direction, as I have now demonstrated to you in the first case. This, then, is a fibrous tumor of the subserous or sub-peritoneal variety, because it springs from the wall of the uterus nearer its peritoneal surface, and was developed from, and not towards the uterine cavity.

Allow me further to trespass on your time by exhibiting another pathological specimen, said to have been removed from the body of a negress. The whole mass is nodular and irregular in shape, with diameters of six and eight inches. It is composed of numerous nodules of fibrous developments, causing globular projections in several places upon its serous surface, varying from the size of a large orange, down to that

of a small marble. These nodular developments are separate fibrous tumors with distinct nuclei, and lie, as you see, very near the peritoneal surface. You will observe that the whole mass is split open to the centre, from the upper part down to the vaginal attachment, and through it to the os uteri. The incision has entered and laid open the cavity of the uterus, from its upper to its lower extremities. In some places you will see small nipple-shaped bodies intruding themselves into the cavity. The wall as thus displayed by the incision, is fully three inches thick almost throughout its extent, and in this thickened wall can be seen great numbers of dense, round tumors, ranging in size quite as much as those found upon the peritoneal surface. In consequence of the presence of this irregular deposit of fibrous growths, the cavity of the uterus is full six inches long, and very tortuous and narrow. Its lateral capacity is not sufficient to admit the finger.

Now in this specimen you will easily recognize the presence of subserous, and sub-mucous, and mural tumors in great numbers, or a general degeneration of the fibrous structure of the womb. You will also observe that some of these tumors are as large as those in the cases where they were single. The diagnosis would have been easy during the life of the patient, by means of the sound and bi-manual examination. I know nothing of the history of the case. The growth must have been slow and unattended with profuse discharges, as the vascularity of the uterus was very slight. We might very properly denominate it a multinuclear fibrous tumor.

Taking these cases and specimens as the basis of my remarks, I propose speaking to you somewhat at length on the nature, mode of development and treatment of fibrous tumors of the uterus. Compared with tumors of the ovaries, with which they are most likely to be confounded, they are of frequent occurrence. I cannot now lay my hands on authoritative statistics

upon the subject, but judging from my own observation I warn you to expect, in general practice, ten fibrous tumors of the uterus to one ovarian tumor. Hence, I repeat, they are of very frequent occurrence, and often overlooked.

Fibrous tumors of the uterus are homologous growths. They are not pure hypertrophies of certain parts of the uterine tissues. As proof of this the tumor-tissue exhibits too much of the rudimentary character of fibres of the undeveloped kind, and there is not a uniform proportion of the different constituent elements. For instance, we find that some specimens are quite firm and resisting, while others are frail. In the firmer variety, the fibrous element is more abundant than the connective, and these ought to be denominated myomatous or muscular fibrous tumors, while the term fibroma would be better adapted to those tumors in which the fibres of the connective tissues preponderate, and the tumor is softer.

The question very naturally arises : How do those tumors originate ? A question that cannot be satisfactorily answered. What we know about their "habits" I will lay before you. They occur generally in persons between the age of thirty-five and fifty, and are found more frequently in women of African descent than in those of European or Asiatic origin. From much observation I am also persuaded that the long continuance of great hyperemia of the uterus strongly predisposes patients to fibrous tumors. Hence, we find them connected with sterility, dysmenorrhœa and menorrhagia. I know that these conditions are often the results of fibrous degeneration, but I have had opportunity of watching many such morbid states of the uterus, which, while giving rise to other symptoms, were constantly attended with hyperemia, in some such cases after years of suffering tumors were developed. One remarkable instance is in a patient who has been under my eye for fifteen years. She is a maiden lady, now forty years of age. A few years after she commenced

to menstruate, she became subject to hyperæsthemia and hyperemia of the uterus. Although I saw her, and made examination of the uterus several times a year during these fifteen years, I discovered nothing which induced me to suspect fibrous growth until three years ago. Then I could easily make out a tumor, with two nuclei of development in the anterior wall of the uterus. When first noticed, the tumor was half as large as an orange. It grew to four times that size in the next twelve months. I have seen so many cases similar to this that I cannot believe hyperemia and the development of the tumor to be a mere coincidence. We know that prolonged hyperemia is one of the necessary conditions of hypertrophy, and it is hardly possible to have hypertrophy without hyperplasia. It would seem, indeed, to be the hypertrophy of the vortices or foci of muscular gyrations in the undeveloped condition of the fibrous structure which leads to the formations of these tumors.

I hope I have been sufficiently fortunate in the selection of examples, and in the explanation of them, to give you a general idea of the various relations of the tumors to the fibrous or muscular walls of the uterus. I have used the terms submucous, intramural and subserous fibrous tumors in describing these examples. These are terms, like almost all other terms used in medical science, too arbitrary to carry to your minds a perfectly correct idea of the facts, without some explanations. All fibrous tumors of the uterus have their origin in the wall of the organ. Some arise immediately in contact with the mucous membrane, then begin to intrude themselves into the cavity of the uterus as soon as they begin to grow, and become pediculated while yet small. Others commence their growth beneath a very thin layer of fibres. These are quite near the mucous membrane, but not in immediate contact with it. They very soon overcome the resistance of the thin layer of fibres, and pushing the mucous membrane before them, become pediculated

later in their growth. If, however, they are deeper in the wall, but nearer the mucous than the serous surface, the larger part of their bulk encroaches gradually upon the interior of the uterus, forming broad tumors that fill the cavity. They can easily be recognized by the finger after dilating the cervical canal. All of these varieties are submucous tumors, but in common professional language the two first are called polypi, while to the last the term submucous tumor is generally given. The term intramural is used to indicate the tumor that arises in the center of the uterine wall; a tumor which in its development displaces the surrounding tissues alike in every direction. In point of fact the exact central mural tumor is very rare, the great majority having their nidus external or internal to the central layer. The subserous tumor varies in its relative distance from the peritoneal surface in the same manner as the submucous from the lining membrane of the uterus. Hence, some of them spring from the outer surface of the uterine wall, are suspended by a very slender pedicle, and covered only by the peritoneum. Others are not so pendulous, but still are enveloped by only a very thin layer of fibres externally. If they are still more remote from the peritoneal surface, they merely show themselves as bulky protuberances on the outside of the uterus. One more statement with reference to position. They are usually developed in the wall of the body, and seldom have their origin in the cervical portion of the uterus. This statement is true of every variety.

A dissection of these tumors enables us to discover that they are surrounded in most instances by a well-marked capsule. It ought not to be called a cyst, for it has not a separate organization, and it is formed by the tissue surrounding the tumor, becoming compressed as they are displaced, until the inner surface of the cavity becomes smooth. At a number of points the capsule and surface of the growth are connected by frail fibrillæ and

vessels. The number and magnitude of these connecting fibres and vessels vary, but it is exceedingly uncommon for vessels of considerable size to enter any of these tumors, and the vascular supply is proportionately small. From these facts the logical deductions, namely, that fibrous tumors of the uterus are of slow growth, of low vitality, and not usually reproduced from their capsule, are corroborated by observation. The source of their nutrition, or their vascular supply, is diffuse, coming through many small channels at various points in their periphery, and not, as in the ovarian tumors, from one great artery. Such a supply is the cause of a somewhat definite period of vitality. It is not capable of maintaining the growth to an indefinite degree, and a disturbance of its nutrition may easily occur. Thus, after they attain a certain magnitude, they are likely to stop growing, and in many instances they degenerate into a lower form of tissue, resembling cartilage, or even to descend still lower in the scale of vitality, and be partially changed into a cretaceous deposit. Again, their low vitality subjects them to the process of inflammation or eremacausis. Inflammation, resulting in gangrenous disintegration, is one of the accidents that sometimes bring about their discharge and cure. At other times it occasions the death of the patient during the complicated consequences thus arising. I have witnessed both of these terminations. The fibrous tumor of the uterus is frequently multiple. I would be disposed to say that in the majority of cases we find more than one nucleus of development, and sometimes, as in the last specimen exhibited to you, the nuclei are very numerous.

The position occupied by the growth is accompanied by a number of important effects. When situated in the centre of the wall—intramural—it grows more rapidly than when in the subserous portion of the fibrous structure, but probably not so vigorously as when nearer the mucous membrane, or when it

belongs to the submucous variety. In fact it will generally be found that the nearer the peritoneum, the nucleus of origin, the more slowly will the tumor increase in size. We also find that the intramural and submucous varieties cause the uterus to grow and become vascular with much greater certainty than the subserous. Indeed, we often find very large subserous tumors growing from a uterus of comparatively small dimensions. This, as you have seen, is the case in one of the specimens I have shown you. The tumor is not less than ten times the size of the organ to the fundus of which it is attached. Notwithstanding the tumor is eight inches long, the cavity of the uterus is not more than three. If a tumor of this size were developed in the centre of the wall of the body of the uterus, the depth of the cavity would be not less than six inches. While the uterus is more than ordinarily vascular, it is not so much so as it would have been if the tumor had belonged to the intramural variety. Of course the polypous, or submucous tumor, develops the uterus with more uniformity than the intramural variety. The uterus, in which there is a polypus, grows with nearly the same symmetry as if pregnant.

It logically follows from these facts that the submucous and intramural varieties are the most mischievous, as the more rapidly the uterus grows, the more certainly will it do mischief by pressure; and the more vascular the uterus becomes, the more hemorrhage will occur. And we find from observation that these inferences are correct.

Again we find that developed in certain zones of the organ their behavior and effects are different. Fibrous tumors comparatively do not often originate in the cervical portion of the organ, and when they do their growth is not very rapid, nor do they cause the uterus to become very large. In the corporal zone they grow most rapidly, cause the uterus to enlarge faster, and do more mischief. Lastly, in the fundus their activity of

growth is less rapid, and produce less morbid changes upon the organ.

In examining uteri containing fibrous tumors, which have fallen under my observation, I have noticed that the character, as well as the degree of development, has varied quite considerably.

The growth of the fibrous structure of the uterus is not exactly the same in character and degree as in pregnancy. The fibres are certainly enlarged, and they become muscular, but in very few localities do they attain to the same perfection as in pregnancy.

In the subserous variety they do not anywhere attain to the perfection of pregnancy, and are usually quite rudimentary in their character. Nor do they possess much contractile power. In the intra-mural tumors the fibres surrounding the growth attain much greater dimensions, and acquire great power. Seldom, if ever, however, do they assume all the qualities of the fibres in the gravid uterus at term. In these cases the fibres in the opposite wall do not keep pace with those surrounding the tumor. In the submucous variety the fibres external to the tumor in the same side in which they originate, are largely developed, while those between the tumor and mucous membrane attain considerable length, but are attenuated, and lack strength. This is *one* reason why they are pushed into the cavity of the uterus.

When the tumor is polypoid, and occupies the cavity of the uterus, especially if it comes from the body near the fundus, filling up and distending the cavity of the body in every direction, it causes great uniformity of development of the fibres. The fibres all around grow more, as they do in the pregnant uterus, attain great power, and usually expel the growth into the vagina.

Very nearly the same statements may be made in reference

to the growth of the vascular system in the different varieties of tumors. The vessels are more enlarged on the side occupied by the tumor in the intramural and subserous than on the unoccupied side. They are more *generally* enlarged in the intra-uterine polypus.

It may be further stated that a single tumor grows more rapidly, causes greater vascularity in the uterus, and brings about greater hypertrophy of the fibres of the uterus than the multi-nuclear form. Indeed, were numerous points of growth to commence at the same time, although great bulk may be attained, the bulk consists in the morbid deposits more than in the growth of the physiological structure of the uterus. This is so markedly the case that after a certain time this kind of tumor stops growing for the want of vascular supply, and becomes transformed into a dense tissue of a vitality far below that in the single tumor. It sometimes becomes a true fibroid degeneration of the whole uterus, in which it would be hard to trace any of the anatomical elements peculiar to that organ.

From this exposition of the growth and effects of tumors upon the surrounding structures, it will be readily inferred that the symptoms observed in connection with fibrous tumors of the uterus are not the same, and must vary greatly in the different varieties. The most frequent symptom is hemorrhage, either at the time of menstruation or during the intervals. In the early periods of the growth the patient will observe profuseness in the menstrual flow, and some cases occur in which this is the only time when there is loss of blood, but in very many instances the losses take place at irregular intervals, and sometimes the discharge is so irregular that the patient will lose her knowledge of the time when she ought to be unwell. In quite a large proportion of cases there is no deviation from the ordinary habit of menstruation. The patient is regular.

The variations of this hemorrhagic symptom conform, in

general, to well known conditions, and we may expect to find the hemorrhage more profuse the nearer the tumor is situated to the mucous membrane. In hemorrhagic cases we shall also find that the size of the tumor has much to do with the flow. The larger the tumor, other things being equal, the greater the hemorrhage. Large submucous tumors will, therefore, cause more profuse hemorrhage than any other sort. In estimating the value of the rule in the correspondence of these conditions, we must remember the frequent coexistence of small submucous with large subserous tumors, and that, as there are exceptions to all rules, we may sometimes have profuse hemorrhage in subserous, and small losses in submucous tumors. The latter exception, however, is very rare.

Leucorrhœa, consisting of thick, tenacious mucous, from the cervical cavity, is perhaps the next most frequent symptom, and it is generally governed by the same rules with respect to frequency and profuseness, as metrorrhagia, being greater in quantity in submucous than subserous tumors.

Watery discharges from the uterus are also a common and significant symptom. They occur more frequently just after and appear to be supplemental to the hemorrhages ; and I must observe with reference to them also, that they are usually more profuse in sub-mucous tumors. It will be observed that all the discharges—hemorrhagic, leucorrhœal, and watery,—show themselves under the same circumstances, and there is a very good reason for this which I mention in passing. The cases in which the tumors are so situated as to greatly increase the vascularity of the uterus, are also the cases in which these discharges are more profuse.

Dysmenorrhœa is not so commonly met with as the three symptoms already mentioned. When it does occur it is of the obstructive variety. It is manifested by cramping pain recurring at intervals. We may account for its assuming this phase

by the fact that the tumor encroaches upon the cavity of the uterus, and renders it tortuous, and in some cases occludes it by forcibly pressing the sides together. The blood is accumulated above these obstructed places, and the pains are caused by the efforts of the uterus to expel the blood thus imprisoned.

The subserous tumor is the only kind that may not occasionally cause dysmenorrhœa. It is probably more frequently present where there is a number of nuclei of development, some of them being submucous.

Among other symptoms, I wish particularly to call attention to that of Pressure. It begins very early in the progress of these growths, and is quite often noticed. The first evidence of pressure is suffering in the pelvis. When the tumor first becomes enlarged, the uterus presses upon the perineum, and this pressure causes a feeling of unusual weight in that region. This "bearing down sensation" may increase, until finally the uterus and vagina may protrude through the vulva; the womb may also fall backwards upon the rectum, and produce tenesmus or other uneasiness in that organ; and not unusually hemorrhoids are thus developed with their attendant symptoms. Should anteversion occur the bladder will suffer from the pressure in the various forms of dysuria, and even inflammation in that viscus. When the tumor is located in the posterior wall, the uterus is retroverted; when in the anterior, it is antevolved. When the organ is enlarged equally in all directions, it will be prolapsed. As it enlarges so as to fill up the pelvis, the pelvic veins are sometimes so pressed upon as to retard their circulation, and there may arise varicosity in the legs, anus, vulva, and surrounding parts. The nerves suffer from the pressure in such a way as often to manifest sciatica and crural, and vulvar neuralgia.

When the tumor is large enough to rise out of the pelvis, it may cause pressure upon the abdominal viscera, and by its

bulk, hardness, and irregular shape, give rise to great inconvenience from distension of the abdominal cavity, producing more suffering than the same distension from most other causes.

Several important complications are likely to result from pressure : such as inflammation of the pelvic viscera, cystitis, rectitis, cellulitis, and local peritonitis. I need not stop to give you the symptoms of these complications, as they are the same as when arising from other causes. The pelvic inflammation sometimes extends to the veins passing through the cavity, and gives rise to phlegmasia alba dolens.

Abdominal inflammations also complicate these cases, some forms of peritonitis especially. A moderate peritoneal inflammation may result in serous effusion, and the ascites sometimes gives rise to more trouble than the tumor, being in some cases the immediate cause of the fatal result.

The consideration of the effects caused by pressure exerted by these tumors, leads me to the subject of their progress and development.

It may be said of them in a general way that their growth is slow. This is especially so as compared with most other growths. In very many cases it requires years for them to attain a magnitude sufficient to endanger the patient's life. Indeed, some patients carry them through a long life without experiencing more than a slight inconvenience. Occasionally exceptional instances occur, however, in which the growth is rapid and very destructive.

The conditions which promote their growth are now pretty well understood ; especially the general proposition that the more vascular the uterus becomes from any cause; the more rapid their growth. The converse of this statement becomes a necessary corollary.

They grow rapidly during pregnancy. During the period of

life in which the menstrual discharges occur in a normal way, the tumor grows more rapidly than after the menopause. The submucous increase in size with more rapidity than the subserous, and the tumor centrally located in the uterine wall generally requires for its development a period of time which may be regarded as a mean between the other two. The multiple ones advance more slowly than the single tumors. There is one circumstance which may add greatly to the vitality of any of these growths, and consequently cause them to grow with great energy. I allude to adhesions to the visceral or parietal peritoneum. When extensive adhesions occur, the vessel of the adherent surface penetrates the uterine tissue, and greatly increases its vascularity. This is so remarkably the case in rare instances, that the peritoneal surface of the tumor becomes reticulated with large vessels. The growths thus usually become very formidable. Occasionally, tumors that have grown so slowly as to seem stationary in this respect, suddenly start up, and their behavior is entirely changed. We see this in subserous tumors in a remarkable manner. It is hardly necessary for me to remind you that this change is generally preceded by inflammation, and that this is the cause of adhesions.

When the tumors, as sometimes happens, undergo interstitial degeneration in such a manner as to cause cavities in their substance, they grow rapidly by an accumulation of fluid in these hollow spaces. This change constitutes a new variety, which is called fibro-cystic. They often become very large, grow very rapidly, and are mistaken for ovarian tumors. Some of our most expert specialists have been betrayed into their removal under this misapprehension, and have been made aware of their mistake only after a careful examination subsequent to their extirpation.

You will learn after much observation that the history and

symptoms, although very important items in the diagnosis, are not sufficient to establish it, hence we are obliged to resort to physical examination. Another observation may be made in this connection ; the greatest difficulties in forming a correct diagnosis will be experienced in tumors of each extreme in size. The medium-sized tumors may be diagnosed without much trouble. In cases of small-sized tumors, we cannot always determine without much care whether the enlargement of the uterus is due to a tumor, or to some other cause. In such cases, the depth of the uterus should be measured by the sound. While the sound is in the uterus, and that organ held in its normal position, the finger is to be passed as high as possible in the rectum, and the posterior wall thoroughly explored. If there is a tumor in that part, it will be found thickened and nodulated. Should this not be the case, you may introduce a male catheter into the bladder, and survey the anterior wall. If the symptoms are sufficiently grave to excite apprehensions and yet leave an uncertainty, the finger may be passed into the bladder instead of the catheter ; otherwise it should not be used.

To ascertain the existence of a small intrauterine or submucous growth, the cervix should be dilated with seatangle, or compressed sponge, until the finger can be passed into the cavity of the body, when there will be no difficulty in finding the tumor. None of these proceedings are justifiable, if there is tenderness or other signs of general inflammation of the uterus.

It is more frequently the case that the tumor is evident, and then the object is to ascertain if it is uterine. To determine this question it is necessary to discover its attachments. This may be done by placing one finger on the mouth of the uterus, and another in the rectum to move the tumor. If it is attached to the uterus they will move together. We should be careful in making this kind of an examination, to make the movements

vary in direction ; if possible, the tumor should be moved from the uterus, or upward, or downward. The tumor ought to carry the uterus with it when moved in any direction. If the sound is passed into the uterus, and the tumor moved afterwards, the instrument, as you have seen, will very plainly indicate the movement of the organ. The cavity will also be increased in length. When a tumor is large enough to be felt above the pubis, the attachment will be more easily made out, by moving it with the hands pressed upon it from above, while the sound is in the cavity, or the finger on the cervix.

The second most important diagnostic indication is the firmness of the tumor. The fibrous tumor is hard and not elastic. Another almost essential circumstance has just been alluded to, viz : the increased depth of the cavity. The history of the case will generally enable us to decide, whether the tumor under examination is one caused by inflammation ; the inflammatory tumor moreover is seldom moveable. A hematocele is behind the uterus, is elastic, and has the shape of the *cul-de-sac*, instead of being globular.

When the tumor is large enough to fill up the abdominal cavity, and become immovable in consequence of its bulk, it is usually elastic. It has become fibro-cystic. We cannot always determine the relation of these tumors to the uterus by the methods I have described. Often we are unable to introduce a sound into the uterine cavity, in consequence of its tortuous direction, and the diagnosis becomes extremely difficult. These are the tumors as I have before said, that have been mistaken for and removed as ovarian tumors. Probably the only positive way of clearing up the diagnosis, is to draw off some of the fluid with a trocar, or aspirator, and make *its character* the test. Dr. Washington L. Atlee, of Philadelphia, in his admirable work on the diagnosis of ovarian tumors, has furnished us with a description of the fluid derived from this kind

of fibrous tumor, that is every way correct. The fluid does not run out of the canula of the trocar with the facility with which the ovarian fluid is evacuated, and often when it is received in a vessel, and becomes somewhat cool, it coagulates, and like blood separates into clot and serum. When examined by the microscope, blood corpuscles and fibrillæ of fibrin are the characteristic substances found. There are none of the cells usually noticed in ovarian fluid, which Dr. Drysdell has so well described. You will find this description in the work I have already mentioned. One other circumstance I failed to call attention to is, that fluctuation observed upon percussion is less decided than in ovarian tumors. If the tumor is large enough to distend the abdomen, it may be complicated with peritoneal dropsy. This condition also renders the diagnosis obscure. Tapping will generally enable us to arrive at correct conclusions. After all the fluid has been removed, an examination of the tumor will enable us to establish its relations to the uterus, as well as determine its density and shape. The fluid in these cases should be submitted to microscopic examination with a view to ascertain whether it came from an ovarian cyst or the peritoneal cavity.

There are several considerations which render the general prognosis favorable as compared with other tumors for which they may be mistaken.

They occur generally in persons who have made a near approach to the menopause, and generally they cease growing after this condition is passed. They grow slowly, and may not be expected to arrive at dimensions sufficiently great to cause fatal consequences for many years, if ever. They often stop growing without any discoverable reason; they sometimes undergo degeneration into inert masses, which remain as mere inconvenient bodies. Nature sometimes gets rid of them by expulsion, or they may be protruded from the uterus into the

vagina, within reach of surgical measures. Lastly, many of them disappear under judicious medical treatment, or all the threatening symptoms attendant upon them may be removed by such means.

Almost none of these conditions obtain in ovarian tumors and very few in any others found in the same locality. I think these considerations will establish the conclusion that the general prognosis is favorable.

The circumstances which in individual cases form an unfavorable prognosis are : the youth of the patient, as they usually grow more rapidly in young persons : the rapid growth of the tumor ; hemorrhagic symptoms ; unfavorable complications, as peritoneal dropsy, inflammation in the pelvis or abdomen, pressure upon the pelvic organs, nerves or vessels ; inflammation of the tumor, impaction in the pelvis, uremia, anemia, pregnancy, ovarian tumor, etc., etc. The fibrocystic variety possess several elements of danger ; its rapidity of growth being the cause of several others, as, pressure, impaction, dropsy, &c,

The complications of pregnancy and labor with fibrous tumors of the uterus is one of sufficient importance to demand special consideration ; especially as we may be obliged to determine a course of action when the emergency leaves no time for research. The simple co-existence of a fibrous tumor with pregnancy is not sufficient reason for interference, and I am persuaded from personal observation that there are but few cases which call for any interference whatever.

I do not wish to be dogmatic but I desire to make a few definite statements of what I regard as facts. Pregnancy takes place more frequently when the tumor is situated in the central zone of the uterus and remote from the mucous membrane ; but it will not occur if the tumor belongs to the submucous variety although it is in the middle, or even in any part of the uterus except the cervical portion of the inferior zone. I have al-

ready intimated that there are very few large tumors developed in the inferior zone compared with those that arise from the central and superior zone, and that such as these are usually developed in the submucous tissue and are generally pendulous —these do not appear to interfere very much with pregnancy. From what I can learn and have observed pregnancy seldom, if ever, takes place when the tumor, being of more than moderate size or situated near the mucous membrane, is located in the fundus or upper portion of the superior zone. In general the larger the tumor the less likelihood of pregnancy, and if it does occur the impossibility of normal uterine development leads to abortion.

The dangers to be apprehended arise usually at the time of labor and consists: I. In the obstruction to delivery caused by the tumor blocking up the pelvis; II. In the incomplete contraction after delivery failing to close up the placental vessels, and thus causing grave, if not fatal, hemorrhage. Tumors situated in the superior zone, the middle zone or the upper portion of the inferior zone will offer little obstruction, because the head will have passed them above the pelvic brim. This leaves but a limited number and those small in size that are crowded down into the pelvis by the side of or before the foetal head; they are the submucous or polypoid variety situated in the cervical portion of the inferior zone. Such tumors are generally pressed entirely out of the vulva and permit the head to pass out after them. I may mention, in passing, that they may sometimes be detached from their base by the pressure of the head; or, remaining intact, may be retracted within the pelvis after the labor is over.

The second danger is, I think, very much over-rated. The fact of the fibrous structure having been developed sufficiently to permit of the completion of gestation is an evidence that it is sufficiently powerful to contract fully, and one single case re-

cently published by Dr. Chadwick, of Boston, in which the placenta was implanted on the uterus over the seat of the tumor, and in which hemorrhage did not prove serious after delivery, goes far to prove that great danger from this cause is not likely to occur. In no case of labor associated with a tumor which has come under my own observation has hemorrhage been a grave symptom.

It is fair, I think, in the light of our present knowledge to infer, that it is seldom necessary to interrupt pregnancy when complicated with fibrous tumors of the uterus, as in the nature of things, gestation will not continue unless there is sufficient integrity of uterine tissue to permit ample development. At the time of labor the indication for operative procedure will appear in the want of progress, and then the obstacles may be surmounted by turning, or forceps, if the propulsive powers of the uterus are not sufficient. Common prudence will incite to vigilance in preventing hemorrhage in these as in other complicated cases of labor. You will observe that while I cannot ignore the importance of watching these cases attentively, I am far from considering them as necessarily very dangerous.

Another question of great importance is, what effect does pregnancy have upon the tumor?

In a minority of cases none whatever. The tumor remains the same after the pregnancy has terminated as before. But in the majority of cases it is far otherwise. In three instances of this nature which have come under my own observation, the tumors have disappeared; and the manner of their disappearance is worthy of remark. In one instance occurring two years since, the tumor was located in the posterior wall of the uterus, apparently in the central portion of it, and occupied the middle zone. The pregnancy proceeded without accident and the patient was delivered at term of a dead foetus, which judging from appearance must have been dead three days before labor

came on. Moreover, according to the calculation of the mother the first pains did not appear until two weeks after the expiration of 280 days. The head was arrested at the superior strait and impinged upon the symphysis pubis, but was easily moved from this position. I did not see the patient until four hours after the membranes had been ruptured. At this time the presenting part did not advance, and, after consultation with the attending physician, Dr. John F. Williams, of this city, it was considered best to interfere. I introduced my hand, seized one of the feet and brought it down. There was no great difficulty in the turning or delivery. The placenta came away in a few minutes with a very slight loss of blood. I had first seen this patient when gestation had advanced to the end of the third month. At this time I believed the tumor to be about the size of a foetal head at term. It was extremely hard and presented two distinct nodules. At this consultation I advised non-interference. I saw her again several times during her pregnancy. She was a primipara. After the delivery of the placenta I felt curious to know what effect the pregnancy had upon the size and consistency of the tumor. In order to determine these points I introduced one hand into the uterus, and with the other manipulated above the symphysis. In this way I could fix and handle the tumor with facility. It then seemed to be about the size of the foetal head and very hard. The division between the firmly contracted uterus and the tumor was marked by a well defined sulcus, traceable by the hand, above the pelvic brim. The tumor seemed harder than the contracted uterus. I had the opportunity of seeing and examining this patient frequently during the year succeeding her accouchment. The tumor was decidedly less in three months, and continued to disappear. At the expiration of twelve months it was no longer perceptible, and the cavity of the uterus measured but two inches and a quarter. The patient now menstruates normally in every respect.

The careful observation of this case convinced me that the tumor had not grown materially larger nor become softened during gestation, and led me to believe that the process of absorption began and proceeded with the subsequent involution of the uterus. What effects may have been wrought upon its tissues by the contractions during labor I cannot of course determine; but the gradual disappearance of the tumor and the non-appearance of inflammatory or other urgent symptoms plainly indicate that the contractions of the uterus during labor, could not have produced any very violent effects upon the tumor. It was also evident that the tumor was absorbed and slowly removed without disturbing the good health of the patient.

In the other two cases I verified the existence of fibrous tumors before pregnancy took place, and one of them I saw again after a lapse of five months, but was not present at the time of parturition of either of them, nor have I seen them subsequently. I have been assured, however, by letters from their attending physicians, that they recognized the tumor after labor, and that they both disappeared within a year.

The treatment of fibrous tumors of the uterus consists largely of the means calculated to relieve such symptoms as endanger the life of the patient or materially affect her general health. When these are unavailing, resort is had to measures calculated to get rid of the tumor. As you will see, however, in the progress of my lecture, some remedies necessary to the relief of symptoms act as very powerful curative agents; hence, while it is convenient to speak of the treatment of symptoms under one division of the subject, and the methods employed for radical cure under another, we cannot, in fact, completely separate these two branches. You need not be surprised, therefore, if I feel myself obliged to depart from this arbitrary method of considering my subject.

Hemorrhage is by far the most important of the symptoms connected with these growths because it is at the same time the most frequent and hazardous. It is also the symptom that leads to most suffering in consequence of depriving important organs of the blood necessary to support them in their functions. Every means, therefore, should be made use of not only to prevent fatal losses but also to prevent even slight hemorrhage. In the outset, therefore, I would insist upon your watching with great vigilance to prevent any unusual loss of blood. You will understand by this that I advise you not to temporize by adopting the milder and less efficient measures as being sufficient for cases not likely to prove fatal, but to treat all hemorrhage arising from this cause with promptitude and energy. Fortunately in many cases we can anticipate the attacks of hemorrhage because we know when they will recur, and we are generally able to judge of their probable severity. To discharge our duty in this respect effectually, our patient should be properly provided with remedies and fully instructed how to use them. She should be made to understand that unusual hemorrhage at the menstrual period may be checked without endangering her general health. Among the remedies are, dorsal recumbency with the hips elevated, cold to the hypogastric region, and cold to the dorsal spine and sacrum which can be effected by means of a rubber pillow filled with ice water; ergot and some form of tampon. The best fluid extract of ergot in drachm doses, if the stomach will bear it, is probably the most efficacious, but the fresh drug in the form of infusion is also very efficient. Full doses should be given every half hour when there is much loss, until some effect is produced upon the hemorrhage, and then continued every four hours as long as necessary. Compressed sponges saturated with the solution of persulphate of iron, half strength make the best tampon for the patient to make use of. These may be made and kept in

readiness, so that they can be introduced as soon as they are found necessary. The patient or nurse can make them by taking a fine sponge, large enough to fill the vagina, passing a piece of strong string through the centre to aid in its removal and then, after dipping it in the solution, well winding it with twine from one end to the other compressing it into as small a space as possible. The twine should so compress the sponge as to make it assume an elongated form. It should then be laid aside and permitted to dry. Several sponges should be thus prepared and dried. When necessary the twine may be unwound and the sponge introduced. Its size when in the dry condition will allow of an easy passage into the vagina where the moisture will cause it to expand, thus filling up and sealing the vagina so as to absolutely check the discharges. If the attending physician is present he may tampon the vagina with pellets of cotton secured by thread and moistened with the solution of iron as recommended by Dr. Sims and others. The inconvenience experienced from this ironized plug will be more than counterbalanced by the saving of blood. This form of tampon has the additional advantage of being antiseptic. I have allowed it to remain for three days and upon removing it satisfied myself that there was no decomposition of the blood or the vaginal secretions. When the tampon is removed it will not be found difficult to wash out all the granular clots caused by its presence. It may be repeated as often as necessary, but usually if allowed to remain forty-eight hours the hemorrhage will not return. It may be said that for small losses this is unnecessary, but I think this is a more convenient form of tampon than any other that will answer the purpose. In dangerous cases no one will question the propriety of its employment.

Another very important means of arresting hemorrhage which can be used by the physician when necessary is the introduction of a compressed sponge into the cervix uteri for the pur-

administered internally, applied externally, and used as vaginal injections. The iodide of potassium has long enjoyed a great reputation in causing the absorption of these and other forms of tumors. There is no professional fairness in assuming that the faith in these remedies, derived from the observation of their effects, or the promulgation of cures from the use of sorbefacient measures, are fallacious. Some of the men arrayed in favor of the opinion that cures may be effected by a patient, and long continued administration of some one of the articles I have mentioned, stand high as men of honesty, accuracy of observation, and faithfulness in their records; and for one I give full credence to their statements. Yet I must also say that I have not witnessed the good results which I unhesitatingly believe others have seen from the sorbefacient treatment alone.

The others who expect much from medicinal treatment look to that class of medicines which causes contraction of the unstriped muscular fibres as the most promising. With these medicines they expect to diminish the supply of blood to the tumor, by causing contraction of the arterioles traversing their substance, and thus disturbing their nutrition to such a degree as to stop their growth, lessen or destroy their vitality, and so render them subject to the influence of the absorbents, whereby they may be removed. Some of the more energetic of these medicines, as ergot for instance, often affect these growths very promptly. It not only lessens the calibre of the small blood vessels, and thus causes a diminution of their nutrition and disappearance, but it causes strong contractions in the muscular fibres of the uterine walls, which lessens more decidedly their supply of blood, and sometimes squeeze and chafe the tumor until it is disintegrated, and rendered a foreign substance. The capsule finally becomes ruptured, and the tumor is expelled either piece meal or *en masse*.

In yet other cases ergot sometimes causes the tumor to descend

into the vagina, where it comes within easy reach of the surgeon, and is removed without difficulty or much danger. To cause these effects it is sometimes necessary to give but a few full doses of the medicine, while in others it requires to be given for a long time.

In a paper read before the American Medical Association, at the Louisville meeting, in 1875, I have reported over one hundred cases, gathered from various sources, in which tumors have been cured in all these different ways. The conclusions deduced from that collection of cases were that about one-third of them were entirely cured, and two-thirds of them favorably influenced by the ergot. Since then I read a paper before the American Gynecological Society, and reported three cases in which the tumors were expelled piece meal under the influence of ergot; and within a few months I reported another very remarkable case of this kind in a late number of the Archives of Clinical Surgery, published in New York City. These results, if I mistake not, warrant an extensive trial of the treatment by ergot, the beneficial effects of which far excel those produced by any other method of treatment by medicines yet adopted.

The modes of administering this remedy have been very various. Some practitioners use the aqueous extract hypodermically, the watery extract being prepared so that one drop represents several grains of the crude drug. When thus absorbed from the subcutaneous cellular tissue, it often acts very energetically. Some others, as Dr. White, of Buffalo, inject this solution into the substance of the tumor. There are two objections only to this very efficacious method of using it, viz., the pain caused by the prick of the needle of the syringe, and the subsequent inflammation—occasionally suppuration—caused by the presence of this substance in the cellular tissue. These objections are so grave as in many instances to preclude its continuance. Some patients, however, bear it better this way

than any other, and it must be regarded as one of the most eligible methods of administering it. For some time past I have generally given it internally in the form of Squibb's fluid extract. I have selected this preparation from among many others, because I have found it to be the most reliable. I begin it by giving the smaller doses, fifteen or twenty minimis, and gradually increasing the quantity until three or four drachms are given daily. In this way we can graduate it to the susceptibility of different patients, and stop it or lessen the quantity as the violence of the symptoms make it necessary. The larger doses sometimes produce very distressing pain, and are used only when it is desirable to endeavor so expel the tumor. By reading my paper you will find that sometimes absorption of the tumor took place under the use of small, and not very frequently repeated doses, without giving the patient much discomfort from the pain produced. The larger doses occasionally causes violent uterine contractions from the first or second time they are given, the contractions continuing notwithstanding the withdrawal of the medicine for many days together. They are sometimes so severe, and their recurrence kept up through such a protracted period, as to require the administration of opiates for their arrest or amelioration; and at times, when the situation of the tumor is favorable for its expulsion, the pain will not even yield to the influence of opiates until the tumor is expelled. In some of the cases I have reported in the communications already referred to, this early and energetic action of the ergot was strikingly displayed. In other instances it was necessary to give the ergot for several weeks in increasing quantities before this characteristic action was established, and yet the results were the same. This energetic action of the ergot is to a certain extent objectionable, but it is so far controllable that it has not in my hands done any real mischief.

In some cases this mode of administering it internally disagrees with the stomach. Rarely, however, is this objection insurmountable, as we can create a tolerance of it by regulating the size of the doses, and selecting the proper vehicle in which to administer it. For menstrua you will find milk, syrup of liquorice, or acacia to be the best at command. We may also give the solid extract, in the form of pills, when the stomach will not bear the fluid extract.

Before drawing my remarks on the use of ergot, to a close, allow me to mention some of the queries that have arisen in my own mind, or have been propounded to me by medical men. If the ergot acts so powerfully in expelling submucous tumors, is there not danger that it may rupture the capsule of the subserous variety, and thus expelling them from the uterine substance into the peritoneal cavity, endanger the life of the patient by causing peritonitis? A proper consideration of the conditions existing in such cases will justify my answering this query in the negative. There is a great difference in the influence exerted by the uterine fibres on the two varieties of tumors. In the submucous variety the whole power of the uterine contractions is exerted *toward* the tumor, driving it in the direction of the os uteri. When the tumor is subserous, the contractions are from the axis of the tumor, and their effect is merely to render it pedunculated, and lessen the vascular supply going to it. The main effect, therefore, will be to check the rapidity of its growth, or to prevent its further enlargement altogether. This statement will sufficiently explain the effects of the medicine upon this variety of these morbid growths. Another question is, does the long continued administration of ergot induce the gangrene of the extremities that has been attributed to it? And still another, does it cause inconvenience or danger by affecting seriously the nervous centres? After having given this remedy in frequently repeated and large

doses, and observed its effects with great care for a number of months consecutively, I can say that I have not noticed any such consequences. I am not prepared to assert that there is, and always will be, immunity from such effects. The worst symptoms I have witnessed are the severe and persistent pains, and the apparent inflammation of the uterus and peritoneum, where its action has been excessive. These symptoms, however, have been invariably controlled by proper treatment, and have in no instance proved disastrous. In other cases, when the tumor was slowly disintegrated and expelled, a moderate form of septicemia has invariably occurred, but this condition has not been sufficiently grave to excite alarm in my mind.

A simultaneous employment of these two methods of treatment—the use of sorbafacients and the administration of ergot—would doubtless in some cases prove more efficacious than either alone. But I am free to confess that this conclusion, so far as I am concerned, is arrived at more from therapeutic inference than observation. As I am giving the results of my own observation more than those derived from the research of others, I deem it but fair to state that I have not given this combined method of treatment an extensive trial.

You are to remember, gentlemen, in your employment of any course of treatment for the cure of these fibrous tumors, that reliable results are not to be obtained without the long continued use of the remedies, and a thoughtful management of them in individual cases. And I must say, in this connection, that I believe a want of these considerations has led to much false experience. You must also remember that the experience in the treatment of fibrous tumors, located in other organs than the uterus, will not serve as a useful guide in the management of the uterine neoplasm. The same conditions do not exist elsewhere. The tumors are nowhere else surrounded with muscular fibres whose action can be commanded by any

remedy within our knowledge. Whether the observation of the profession at large will or will not at present bear me out in my earnest belief in the curability of some of these tumors by the means I am now teaching you to adopt, I do not know; but I am sure that there is so much logic in the method that it deserves a much more extensive trial than has hitherto been made of it. This application of ergot was first accidentally discovered by Prof. Hildebrandt, whose observations are detailed in the *Berliner Wochenschrift* of 1872, and I confidently and hopefully look forward to the proper development of the same as a means of doing more to remove this *opprobrium medicorum* than any other plan of treatment which has hitherto been adopted.

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At a meeting of the American Medical Association, in this city, in June last, Dr. Cutter was kind enough to illustrate his method of operating. He uses electrodes invented especially for this purpose. They are spear shaped and mounted upon handles in order that they may be directed with the more certainty, and made to penetrate hard, fibrous growths without

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deviating from their intended course. The blades are five and one half inches long, and are insulated to within nearly one inch of the point. Two of these electrodes are inserted through the abdominal wall, into the substance of the tumor, the points being separated by a space of several inches. Through these electrodes a galvanic current is passed, the electricity being generated by eight pairs of carbon and zinc plates, excited by saturated solution of potassic bichromate and sulphuric acid, one part of the former to two of the latter. The time allowed at each setting varies from three to fifteen minutes. It was said that this operation did not produce much pain and was usually followed by a copious flow of urine. The number of operations for the individual cases varied from one to nineteen, and the intervals between them, from a day to two months. In certain desperate cases, this seems to me to be a valuable resource. Although, however, in the hands of these brilliant surgeons, this mode of performing electrolysis seems not to be attended with the dangers one would expect to follow such free penetration of the abdominal cavity and galvanic excitement of these growths, most of us would hesitate to follow their example. They will doubtless pursue this mode of treatment sufficiently to test its efficacy and danger, and thus enable the profession to properly estimate its value. Possibly it will be found by further experiment with electricity that very much smaller electrodes and a less powerful battery may produce altogether, effects sufficient to dissipate these tumors and at the same time greatly reduce the hazard of the operation.

This occasion, gentlemen, will not permit a full discussion of the surgical treatment of fibrous tumors of the uterus, and it will probably be better for me to confine my remarks to the most approved methods of removing the submucous variety with which the name "polypus" is associated. The first thing I have to say about the operations intended for this purpose is

that they should be as simple as possible, compatible with thoroughness. It is not necessary to exemplify this idea. It is self-evident, and yet often ignored. The most effectual plan of avoiding danger is to have a distinct idea of the sources whence the danger may arise, and in connection with these tumors, danger may arise, (1) from laceration, contusion or other damage to the uterus, resulting in hemorrhage or inflammation ; (2) incomplete ablation—the remaining portion producing septicema ; (3) shock sometimes following protracted efforts at removal. This, though less frequent, is a very important source of peril.

These dangers will, therefore, for the most part be proportionate to the extent of manipulation and instrumental procedure and the incompleteness of the operation. The old operation of tying the neck of the tumor, and allowing it to slough away, especially when it was situated in the uterine cavity, combined all the causes of danger above enumerated except that arising from hemorrhage ; and it is a curious fact that this operation was invented for the sole purpose of avoiding hemorrhage, which is really the least dangerous of all, according to my observation. Indeed I have never seen serious hemorrhage caused by the removal of a polypus, however effected. The practice of ligating the tumor and then amputating it is to a less degree open to the same criticism.

Torsion, or amputation are the methods now usually employed by the best gynecological surgeons of the present day, and the first is the one I have for several years resorted to in almost every instance. Amputation may be performed by the scissors, knife, by the ecraseur or galvano-cautery wire All possible danger from hemorrhage will be avoided by the last means indicated ; but I may state to you that there is scarcely any danger of hemorrhage from the use of either of the other instruments. Torsion is performed by seizing the tumor with

strong vulsellum or fenestrated forceps and twisting the tumor several times around and making moderate traction until the detachment and removal are completed. In order to amputate a polypus when the tumor is partially or wholly expelled from the uterus the tumor should be drawn down with one of the forceps mentioned until its attachment is brought into view, when with the scissors or the knife the neck may be divided as close to the uterine attachment as possible without cutting the substance of the uterus ; or the neck of the tumor may be surrounded by the ecraseur or galvano-cautery wire and separated by it. A tumor attached to the fundus, or high up in the body of the uterus, cannot always be drawn down and amputated in this way without causing inversion of the organ, and consequently a knife in the shape of the blunt hook in your obstetric case, with an edge upon the concavity of the curve will be necessary. This may be introduced and guided as nearly as possible to the point of attachment by the finger or hand. This process is very much facilitated by a piece of twine passed through a small hole in the extremity of the hook ; the twine should be long enough to hang out of the vagina and give a firm hold. When placed, the convexity of this knife should be turned towards the neck of the tumor and a sawing motion executed by the handle and twine until the tumor is cut through.

I here show you one of these knives. As you see the end of the hook is slightly bulbous to prevent it from wounding the uterus. This is a very difficult operation and not entirely without danger even when skilfully executed.

The wire of an ecraseur may be carried to or near the point of attachment by means of two flexible rods with small holes in the extremities. The wire is passed through the opening at the ends of the rods, and being held closely together they are introduced, carried behind the polypus, as high up as possible. One of the rods is then held in position while the other is

carried around the tumor, thus encircling it by the wire. Sometimes it will be easy to pass the wire by drawing a loop of it through the perforated ends of the rods, large enough to pass entirely around the lower end of the tumor, and as the rod ascends, the wire surrounding the polypus is carried up to the point of attachment. When well placed, the ends of the wire may be fitted to the ecraseur, and that instrument carried up to the ends of the rods. The ecraseur can then be manipulated until the tumor is separated. There is no need of removing the rods from the wire before the ecraseur is fixed, as their presence does not complicate the operation.

All this explanation presupposes an open or dilatable condition of the os uteri which does not always exist. If the mouth of the uterus is not already thus patent, it should be dilated by compressed sponges until it will admit of free access.

It requires much experience and tact to perform this operation with the ecraseur, and you will find in the books and periodicals a number of instruments intended to facilitate the application of the wire to the neck of the tumor. The dangers connected with this operation are those caused by the protracted efforts to place the chain or wire of the ecraseur, and an inability always to remove the whole tumor.

The operation of torsion can be performed when the tumor wholly or partly occupies the vagina without any preparation, and is preferable, because the tumor is removed at the point of attachment. The reason of this is, the point of attachment is always the weakest and yields to the force applied before any violence occurs to the other parts of the tumor or the uterine tissue. The tumor is thus completely removed, and without protracted manipulation. No hemorrhage results, for two reasons : (1) there are no large vessels entering the tumor, and the small ones are torn instead of being cut as in amputation ; (2) septicemia does not occur, for no portion of the tumor is left to slough.

When the tumor is higher up or within the cavity of the uterus, torsion is equally appropriate, and more easily executed than amputation with or without ligation. Of course if the mouth of the uterus is not open enough to permit the seizure of the polypus at a point high enough to secure a sufficiently firm hold upon it, dilation is just as necessary as in the other operations. The amount of dilation however, will not need to be so great. In performing this operation, the operator must guide the forceps with his fingers to the part of the tumor necessary to enable him to fasten the instrument upon or near the central part of the polypus. In two instances when the tumor was too large to be firmly held by any forceps at my command, I introduced the hand inside the uterus and detached the tumors by rotating them with the hand until they were detached, and afterwards making traction with the forceps.\* I brought them into the vagina and delivered them with the obstetrical forceps. One of these weighed forty-six ounces.

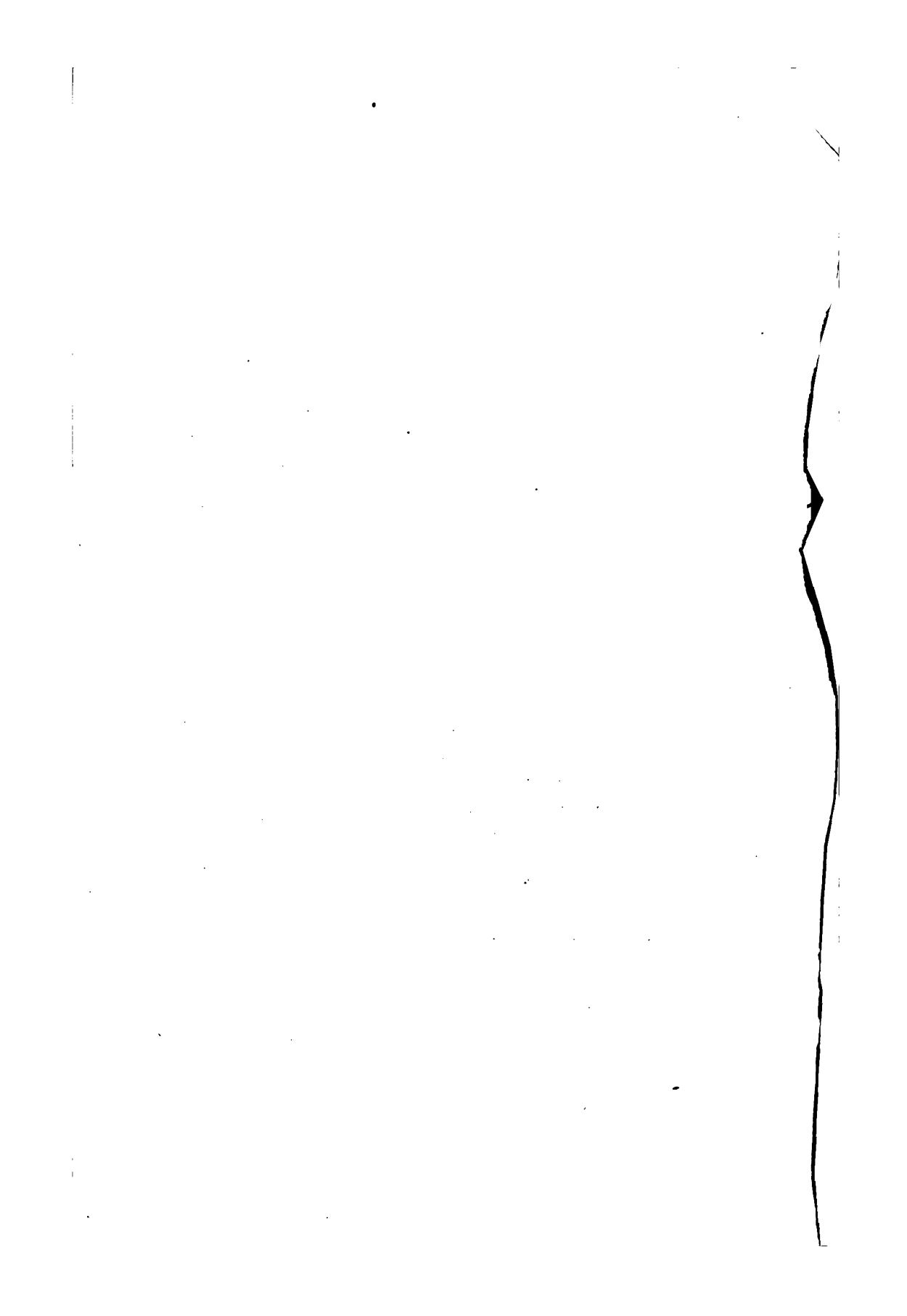
To perform torsion for the removal of a polypus, the surgeon, after fixing the instrument firmly in the desired position should be careful to twist it enough to be sure of its detachment before commencing traction. Not less than from four to six complete revolutions should be effected. This procedure will prevent the danger of lacerating the tissues of the uterus.

The greatest objection urged against the operation of torsion is the likelihood of lacerating the wall of the uterus at the point of attachment. If you will call to mind what was said about the relative thickness of the muscular strata upon each side of the different kinds of fibrous tumors, you will at once perceive the groundlessness of this objection. In the pendulous variety, the whole wall of the uterus is outside the point of attachment and is strong enough to resist the very few fibres that are carried down with it. Indeed in the polypus there is almost no substantial attachment except that formed by the investing

mucous membrane. If, therefore, the torsion is performed with sufficient thoroughness before traction is begun, laceration of more than the superficial tissues surrounding the neck of the tumor is next to impossible, and consequently the operation is perfectly safe.

Hemorrhage is not so likely to occur after torsion as when the tumor is amputated by the knife, or scissors, or even by the ecraseur. The danger of hemorrhage, then, is an objection that cannot with any show of reason be urged against torsion. I have never seen hemorrhage succeed torsion. The contractions of the uterus which take place after removing the polypous growth from the cavity of the uterus, in the great majority of cases is as effective in the prevention of hemorrhage as it is when its contents are expelled at the time of labor. I trust that it is not necessary to dilate further upon this part of the subject. However, let me remind you that as hemorrhage, although improbable is yet possible, you should be prepared for it. After what has been said under palliative treatment about the management of this complication, it will not be necessary to enlarge upon that point. Again, I would, therefore, refer you to the remarks then made.

After an operation of this kind the only treatment necessary is perfect quietude for a few days, cleanliness by injections if needful, and the administration of anodynes to quiet pain. When a tumor has been removed from high up in the uterus the patient should of course be carefully watched, and if symptoms of inflammation or septicemia arise they should be treated by suitable remedies.



## CERVICO-DORSAL PARALYSIS OF PERIPHERAL ORIGIN.

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**GENTLEMEN** :—In this bright little fellow who walks erect before you, with his hands deliberately placed in his pockets, you will scarcely recognize the strangely deformed patient who was first brought into this room about eighteen months ago. You who were then present will remember him, bent forward, almost double, with his head drawn backwards until the occiput nearly touched the spine between the scapulæ. The spinal column also exhibited a decided double lateral curvature, in consequence of the unequal distribution of muscular vigor in the muscles on either side of the back-bone. You will remember, however, that when he clasped his hands and applied them to the back of his head, so that his arms were substituted for the anterior cervical muscles, he could stand erect, and could walk, though with a somewhat constrained movement, in that position.

Let us briefly recall the history of this case. About two years ago the little boy's mother, a healthy American woman, noticed that her son, then not far from seven years of age, was

"growing crooked." He was, as you see him, a fine, active, happy-tempered child, "blue-eyed and fair of face." His family knew no constitutional disorder nor any hereditary tendencies to disease. The child himself had never experienced any illness, with the exception of what his mother thinks was an attack of mumps, which occurred a few months prior to the commencement of the present deformity. He lived in the country, and was attended by no physician: his mother's opinion may be correct—I am unable to decide. She is positive in her statement that he never had sore throat, nor diphtheria, nor scarlatina. It is, as we shall presently see, only within a few weeks that he had the measles. He was, and always continued to be, a nimble little chap, as vivacious and as fond of play as any of the other boys, a disposition which he could freely indulge, for the vigor of the muscles in his legs and arms never gave way.

Two years ago, then, our patient began to exhibit the signs of a deformity, which gradually increased, until he had assumed the figure in which you first made his acquaintance. Living in an humble sphere of life, his parents could secure for their child but little, if any, medical attendance; and nothing was done for his relief, unless we take into consideration a very homely supporter—a sort of dorsal crutch which his father whittled for him out of a piece of wood, and which he occasionally wore for a few hours at a time. Attracted by the fame of our distinguished professor of surgery, these anxious parents found their way at length to the weekly surgical clinic held in this college. There, however, the non-surgical character of the disease was immediately recognized, and the boy was placed under my care. At first, his condition was exceedingly discouraging. Both sterno-cleido-mastoid muscles, and, apparently, all the anterior cervical muscles were motionless. Some of the lateral muscles of the neck, undoubtedly, retained

their contractility. All the posterior cervical muscles were relaxed and flabby, with the exception of the left splenius capitis which alone supported the head—which, in fact, kept the head drawn backwards beyond all limits of symmetrical development. The muscles of the limbs and trunk were all intact; but many of the groups which make up the *erectores spinae* were paralyzed, so that the dorsal aspect of the trunk was visibly emaciated, and the tendency to lateral curvature was almost as conspicuous as the antero-posterior derivations. The electro-muscular contractility of the affected muscles—tested with the Faradaic current—was almost wholly abolished. The facial, cranial and oesophageal muscles were all in good condition. The organs of special sense and the general cutaneous sensibility were everywhere perfect.

Such, then, was the condition of our patient. Impressed by the resemblance of the case to many of the cases of paralysis which occur as sequelæ to various acute diseases, I repeatedly questioned the mother concerning the antecedent history of the child. She, however, persists in the statement that with the exception of mumps he never had any sickness, not even a sore throat, before the commencement of the paralysis. Evidently we can get very little information regarding the exciting cause.

For a number of months the little fellow continued to attend the clinic, though with very little apparent advantage to himself. He was treated with small doses of bichloride of mercury and with iodide of potassium. He took cod-liver oil constantly and in considerable quantities. Living out of the city, and coming into town only once in six weeks or two months, it was impossible to attempt the use of electricity. My hopes of his recovery were not very enthusiastic, but his parents were very persistent. The paralyzed muscles were thoroughly rubbed with oil twice every day, and a spinal brace was contrived by a

surgical-instrument maker for his benefit. For some reason it did not prove very successful, and was not often used. At length, however, after seven or eight months of this treatment, I discovered one day, that the right splenius capitis had resumed its functions, and that the left sterno-cleido-mastoid muscle could be made to contract when stimulated with a powerful interrupted current of electricity. About this time some one loaned the family a magneto-electric apparatus which was used at home with considerable assiduity, but without any manifest result. In this way the last summer and autumn were occupied. During the winter, it was evident that the general nutrition was improving—the child was accumulating fat. I sometimes gave iodide of iron instead of iodide of potassium and mercury. Once I gave him strychnia; but it did not seem to produce any favorable effect, and was soon discontinued. Very naturally, the child disliked the constraint of his brace, and seldom put it on, preferring the freedom and activity which even deformity could not arrest. Some time before Christmas his father asked me if "angle-worm oil" would be objectionable as a liniment. Recognizing the value of manipulation in all such cases, I endorsed the proposition, and the boy was well rubbed with the odiferous stuff, but without any tangible result. As the winter advanced he ceased to attend the clinic, and for three months or more, we lost sight of the case. To-day, however, he comes again to report himself, and you can all see how great an improvement has taken place during that interval. Very naturally, you will desire to know the cause of such rapid change. Was it some new advice or some new medicine? He has received no medical attention except what has been given here. He has taken the same drugs that were last prescribed for him at this clinic. But during the month of February, about ten weeks ago, he had the measles. It was an ordinary attack of that disease;

but as he convalesced, his paralytic symptoms began to disappear. From that day to the present his improvement has been unchecked, and it bids fair to continue until he shall be completely restored to health.

Such is the history of the case before us. What was the nature of the disease which produced the deformity in question? As the narrative shows, it was something which to a superficial observer might have suggested the idea of Pott's disease of the spine. The position of the head was not so very unlike that assumed by a little child, who was brought here not long since with caries of the cervical vertebræ. But in that case it was impossible to bend the neck in any direction. The ruins of the cervical column had become cemented together in such a way as to preclude all possibility of motion in any direction—at least without causing so much pain as instantly to arrest the attempt. Here, on the contrary, we have always been able to procure free and painless movement of all the joints of the vertebral column; and when artificially sustained, all deformity disappeared. The bones, therefore, and their articulations have not been diseased.

Is it the muscles, then, that have been at fault? Certainly, there has been no absence of the muscular structures. They could always be traced in the regions of deformity, though many of them were flabby, and apparently incapable of contraction. Sometimes, in consequence of injury or inflammation, the muscles will not contract; but in such cases they are painful, and will not tolerate artificial displacement. Sometimes the muscles waste and become useless from long confinement in a fixed position, such as must be assumed after a dislocation or a fracture. In those cases, however, electricity soon awakens a responsive movement, and the history of the case is sufficient to enlighten the diagnosis. Our patient has never sustained any injury, and has never been subjected to

any form of muscular constraint. Excluding, then, all diseases of the bones, and all primary affections of the muscles, we are compelled to seek in the condition of the nervous system an explanation of the paralytic disorder. We may, for the sake of convenience, divide the nervous system into three sections: the cranial, the spinal, and the péripheric. Paralysis of cranial origin is unilateral (occasionally, in almost necessarily fatal cases, bilateral), arresting all voluntary motion upon one side of the body and face. Sometimes we meet with cases of unilateral paralysis, restricted to a single member, caused by disease involving a limited area upon the surface of the cerebrum in the vicinity of the fissure of Rolando; but such examples are rare. As a general rule, when the muscles of the head and face escape paralysis, the hemiplegia is of spinal origin. In the present instance, the functions of all the cranial nerves were intact, and the paralysis was neither hemiplegic nor discoverable in any of the limbs. Intra-cranial disease was, therefore, to be excluded from the case. The condition of the spinal cord should then be passed in review. Inflammation of the membranes, or tumors pressing upon the cord may occasion paralysis; but the loss of voluntary motion is limited to the territory below the lesion in one case, and in the other the difficulty is more apparent than real—the patient can execute muscular movements, but he does not because of the pain which would follow the attempt. This patient has never complained of pain, and he could always move his limbs without difficulty, so we may dismiss all thought of tumor and of meningitis.

I remarked just now that the patient has never complained of pain. In fact, so far as I can ascertain, there has never been any disturbance of the sensory apparatus. This circumstance, coupled with the fact that there have never been any errors of nutrition involving the skin and other sensitive sur-

faces, excludes the posterior columns of gray matter in the cord. Finding neither sensory disturbance, nor pain of an intermittent character, nor errors of vision, nor ataxia, we may exclude the posterior white columns as well as the corresponding gray columns. There have been no contractures, for the apparent contracture of the splenius muscle was in reality only the natural shortening of a muscle that had lost its antagonist. This will exclude changes in the white columns of a character likely to irritate the anterior roots of the spinal nerves; and as there has been no interference with the passage of voluntary impulse to the muscles of the limbs, we can admit the universal integrity of the antero-lateral columns of the cord. Can we say as much for the anterior columns of gray matter? Let us see. The functions of the lower limbs, the movements of the abdominal and intercostal muscles have been perfect. The play of the diaphragm has been without impediment, and there has never been any special difficulty in the use of the upper extremities. This certainly is not consistent with disease of the anterior cornua, either in the lumbo-dorsal or in the lower cervical region of the cord. But in the dorsal region we have seen that there was paralysis and atrophy of certain muscular fasciculi, which should prevent lateral curvatures of the spine. These muscles receive their nerves from the same trunks or roots which connect the intercostal muscles with the cord. The intercostal nerves being intact, the difficulty must in the dorsal region have been outside of the cord—in other words, a paralysis of peripheral origin. Such a conclusion affords presumptive evidence that in the cervical region also the gray matter of the cord has always been healthy. Can we in the neck itself find additional evidence in favor of this view? Well, the upper extremities have always been under perfect control of the will, a fact which excludes from disease the four lower cervical nerves on each side. The phrenic nerves and

the pneumogastrics have never refused duty. The tongue has always moved admirably, a fact which saves the hypoglossal nerves. The muscles of phonation have never succumbed, consequently the internal branches of the spinal accessory nerves were not implicated. But the complete paralysis of the sterno-cleido-mastoid muscles, and of the upper portions of the trapezei, shows that the external branches of these nerves were incapable of function. Of the deep muscles of the neck, the anterior recti were certainly paralysed on both sides. The lateral muscles were not paralysed. The posterior muscles on the right side were motionless, and the head was retracted by the left splenius, and perhaps also by the complexus. Now, such an irregular distribution of disease, involving certain branches of the upper cervical and accessory nerves, while others escaped entirely, seems to exclude the probability of a central lesion situated in the gray matter of the cord. We have had to do with a case of peripheric paralysis, involving a limited number of the nerves distributed to the muscles of the upper cervical and dorsal regions of the body. Peripheral forms of paralysis, producing various degrees of wry-neck, are not very uncommon; it is, in fact, only the peculiar extravagance of deformity which renders this case so remarkable.

What was the cause of the disease? The history is in this respect very obscure. There has been no injury placed on record. Exposure to cold is a fruitful cause of peripheric paralysis, but we cannot ascertain the occurrence of any unusual exposure. We sometimes meet with paralysis as a sequel of certain infectious diseases, *e. g.*, torticollis following scarlet fever, and I made careful inquiry for some such antecedent event. There was much in the aspect of the case to remind me of the paralysis which occasionally follows in the train of diphtheria. Can it be that the disorder, by his mother called mumps, was indeed a diphtheritic engorgement of the glands

behind the jaw? If so, we must recognize the existence of a form of diphtheria without sore throat, or particular disturbance of the general health. It is not, however, necessary to press this hypothesis, for it is well known that local paralysis may follow almost any acute infectious disease. The so-called "diphtheritic paralysis" is not a specific disease. I have seen it occur as the sequel of a trifling herpetic tonsillitis, at a time when diphtheria was not at all prevalent. Trousseau, and many other careful observers, have seen the same thing. It is a fact, which I desire especially to impress upon you, that certain palsies may occur either as a consequence of infection, or of injury, or exposure to cold, and that, while they all generally tend to recovery, that tendency is most conspicuous in those instances which have been originated by infection. Diphtheria, typhoid fever and malarial poisoning are perhaps the most common antecedents of these infectious paralyses, but so closely related are the resulting phenomena, that whenever you meet with a case which cannot be clearly referred to cold or injury or metallic poisoning, I think that the hypothesis of an infectious cause will be fairly admissible. In such cases the paralysis bears to the antecedent disease a relation analogous to that which is sustained by the albumenuria which is so often a sequel of infection. And as in albumenuria it is to a disturbance of structure in a single organ that we trace the symptom, so in these cases of paralysis it is to a particular region of the nervous territory that the loss of motion may be referred. It is the motor tract which is liable to become a scene of disorder. The paralysis often begins around the pharynx. The patient cannot swallow, and his voice becomes nasal, though he is still able to use his hands, and to walk perfectly well. Other cases resemble the child whom you saw last week, who became rapidly paraplegic two months after an attack of diphtheria. When first brought here that patient

could not stand ; he could not sit alone, but now he is walking without help. The paralysis never invaded the upper part of his body, and he could always use his hands. With all this variety in the matter of vertical distribution, there is no tendency to invasion of the sensory apparatus. Patients retain all their power of feeling, and bed sores do not destroy the skin. The functions of the bladder and rectum are never disturbed, a fact which points to the integrity of the sensory centres in the cord and brain, as well as to the perfection of the avenues for the transmission of cerebral impulse that exist in the antero-lateral columns of the cord. Theoretically then it is either in the peripheral motor nerves, or in the gray matter of the anterior cornua, or in both, that we must look for the fugitive changes which occasion these paralyses. Fortunately for the patients they generally terminate in recovery but fortunately for science they are sometimes fatal, and then the microscope enables us to verify the previsions of theory. Very recently this subject has been reviewed by Dr. Déjérine, of Paris (*Archives de Physiologie*, No. 2, 1878.) He finds in diphtheritic paralysis that the posterior nerve-roots and the white substance of the cord, together with the posterior cornua of the gray matter, are healthy. The anterior cornua exhibit slight changes of an inflammatory character, along with a diminution in the number of the large motor cells. It is the anterior roots of the spinal nerves which most conspicuously display the changes wrought by inflammation and fatty degeneration. The appearances recall to mind those which are produced in the distal portion of a nerve after separation from its trophic centre—proliferation of nuclei, disappearance of axis cylinders, and granular degeneration of myeline. Such changes, however, are not permanent. After section of the trunk of a nerve, the cut ends may reunite, and new nerve fibrils will appear in the midst of the cicatricial tissue until

the restoration of function becomes an established fact. In like manner, undoubtedly, the inflamed nerve trunks in the cases under consideration become renovated, and once more capable of resuming their appropriate function.

Let us now briefly review the correspondence between the symptoms in this particular case and the lesions which I have described, and we shall find them characteristic of a neuritis localized in certain branches of nerves rather than in their spinal nuclei of origin. It is obvious, however, that so far as voluntary and trophic impulses directed towards the muscles are concerned, the effect must be the same whether the lesion be situated in the branch or in the trunk, or in the root of the nerve. The lesion serves to interrupt the continuity of transmission between the muscle and its motor-trophic centre in the cord, and, consequently, the muscle ceases to move, to grow, and to respond when irritated by an electrical current. Thus limited to the peripheral nervous apparatus, it is impossible to account for the deformity which at one time existed by supposing the occurrence of contractures in certain muscles. Contractures are the result of irritating lesions, situated in the antero-lateral columns of the cord in territory adjacent to the motor root-fibres of the spinal nerves. These lesions may assume the character of interstitial inflammation, or they may be superficial—even meningeal. But it is hardly possible for a contracture of meningeal origin to exist without an immense amount of suffering, caused by co-incident irritation of the posterior spinal nerves. As an illustration of this let me remind you of the two patients with myelitis, who recently died in my wards at the hospital. The first was a case of paralysis of the left arm, with contracture of the biceps muscle, and progressive muscular atrophy of the interosseous muscles of the hand. The patient suffered no pain, and the autopsy disclosed a healthy condition of all the envelopes of the cord. The

second was a case of diffuse myelitis, seated in the lumbar enlargement of the cord. The unfortunate patient, though utterly paraplegic, suffered excruciating agony in the right hip and inguinal region for many weeks before death. At the autopsy this was explained by the discovery of a circumscribed meningitis, causing an adhesion between the visceral and parietal surfaces of the sheath of the cord at the point of emergence of the upper posterior lumbar nerve roots on the right side. But in the case now before you there has been an utter absence of such phenomena. When the patient came before you for the first time, it was difficult to resist an impression that the retraction of the occiput was due to a real contracture of the single muscles in the back of the neck, which had remained unparalysed. A little observation of the child was sufficient, however, to establish the difference between this retraction and a genuine contracture. The head was drawn backwards because the contracting muscle had no antagonist. Whenever he chose to do so, the child when stooping over could relax the muscular tension, and could thus permit his head to sink forwards until it assumed its normal position at the extremity of the spinal axis. This adjustment was the result of an effort of will. The normal position, assumed as a consequence of reflex action, was the attitude of retraction. The forward inclination of the spine, though favored by the weakened condition of the erector group of muscles, seemed to be largely due to a movement of compensation on the part of the psoas and iliacus muscles, rather than to any contracture of the anterior muscles of the trunk, for when the head is drawn backwards until the face regards the zenith, it is impossible in that position to examine objects in the plane of the horizon without first accomplishing a very decided forward inclination of the body. This also explains the manner in which the patient could so easily stand erect with his hands behind the occiput.

Having now considered the history and the symptoms of the case, let us pass in review the principles which should govern the treatment of our patient. In the first place we must learn the natural tendencies of the disease. Experience shows that in the closely related disorder which produces infantile paralysis, the destruction of the nervous elements is usually final. The best result that can be hoped for is restriction of the disease within narrow limits. The same thing is true of the irritative changes which produce muscular atrophy. But in diphtheritic paralysis it is no uncommon thing to meet with recovery, and the improvement is often so rapid and so complete as to suggest the idea of spontaneity in its course. The paralysis is in a certain sense a self-limited phenomenon, just as the exanthem of measles pursues a regular course of evolution and decline. The more nearly then a given case of peripheral paralysis can be shown to resemble the palsies of infectious origin, the more confidently may we anticipate a self-limited and favorable course. This analogy must not be pushed too far, because there is no hard and fast line of demarcation between the destructive lesions, caused by infection and the interstitial changes which may result from simple inflammation. The changes which occur in the nervous structures, as a consequence of syphilis, well illustrate this point. A spinal inflammation of syphilitic origin, for example, will produce, if left to itself, as perfect and as permanent an abolition of the functions of the cord as can be effected by an idiopathic sclerosis. But such a specific change is far more amenable to treatment than is usual with non-specific disorders—in this respect exhibiting a kinship to the lesions produced by diphtheria. The results of treatment, therefore, will as a rule be more encouraging in the class of infectious paralysis than in cases of idiopathic origin.

But even though we may assume such a law for paralysis of

infectious origin, it throws very little light upon the etiology of the present case. The boy did not seem to be in any very marked degree affected by such treatment as he received. That the circumstances were of the most unfavorable character for a rational and energetic process of treatment is very true. Perhaps a course of electricity—the constant current derived from a large number of galvanic elements—might have been found at least as efficacious as it so often appears in the paralysis of infants. However that may be, the only conspicuous agent of cure seems to have been the measles. His mother, very naturally, holds that disease in the highest esteem as a remedy for deformity. She feels no sympathy with our enthusiastic friends, who would move heaven and hell to banish measles from the face of the earth. As a matter of fact, I do not think that her opinion is very far out of the way. You will hear a great deal said about "stamping out measles and scarlet fever," and such diseases, as if they were something greatly to be deplored. It is true that epidemic diseases are occasionally followed by very unfortunate sequelæ; and it is easy for a man who is unused to the examination of all sides of a subject to draw a frightful picture of the evils which grow out of the prevalence of any particular disorder. But a little cool observation of the world will soon convince a candid mind that there is no such thing as unmixed evil in anything. Dropsies and palsies and deformities are the sequelæ of disease about which the doctor most frequently hears. These are the sometimes permanent facts which impress the community, and give their cause a bad name. But much more frequently will it be your lot to enjoy the pleasure of seeing that the period of convalescence from an attack of scarlet fever, or of measles, or even of typhoid fever, is the commencement of a great and durable improvement in the health of an individual—a fact too often overlooked in the

estimation of epidemic disease. Had we time for such a digression, it would be interesting to dwell upon this topic, and to consider at length the real meaning and genuine value of epidemics considered as agents in the work of elevating and improving the human species by natural selection. The doctrine is to some of you rather novel, and is not popular among sentimentalists and enthusiasts, but it is founded upon facts, and will finally win its way to recognition among all truly scientific students of nature.

But, to return to our subject: it being evident that the attack of measles was in the present instance the most efficient of all the agencies brought to bear upon the patient, you will naturally wish to ask how the disease could have been curative. There was surely nothing homœopathic in the case, for measles is not a paralytic disorder, and it is very rarely followed by any form of paralysis. Some one suggests that it was operative by virtue of an intensely counter irritative action upon the skin during the period of eruption. I cannot agree with this opinion, for, whatever may be said of the eruption of scarlatina, it does not seem to me that the purely counter-irritant effect of a course of measles can be compared with the energy of even so few as half a dozen blisters. I suppose the great and unquestionable efficacy of the process to be referable to its pervasive character. Measles is a disease which extends to every portion of the body. It may be compared to a sweeping prairie-fire which destroys every living thing upon the face of the earth, but does not disturb the vitality of the roots and seeds which lie beneath the soil. I need not remind you of the luxuriant wealth of verdure which springs up in the track of such desolation. Just so, in the present instance, the period of convalescence is a time of unwonted activity in all the processes of removal and renovation. Under the stimulus of these conditions, the products of chronic inflammation are

removed, and new cell growths spring up with a rapidity only comparable to the rate of tissue formation in the nursing infant. In this way a recovery which ordinarily might have been protracted through many months or years, has now been compressed within the limit of a few weeks, and in place of the tedious course of an artificial cure, has been substituted the more agreeable experience of a natural recovery.

From an experiment like this we obtain the clue to an interpretation of many of the phenomena of therapeutics. You can now readily comprehend something of the nature of the process which renders vaccination sometimes curative in whooping cough. The exanthematous diseases are characterized by an immense amount of tissue-change and elimination. This is precisely the one thing needful when the function of a delicate piece of apparatus is impeded by the accumulation of the refuse products of its own activity. Each individual molecule is overwhelmed by its waste, like a saw-mill buried in its own dust. There must be a general evacuation of rubbish before the works can go on. Something analogous, no doubt, obtains in the nervous structures involved, let us say, in whooping cough. The interstitial changes attendant upon the evolution of vaccinia are as far-reaching, if not fully as energetic, as those which attend any other exanthematous disease; and being largely of an eliminative and restorative character they expedite the similar processes which should mark the decline of the paroxysmal disorder. In like manner it is not difficult to interpret the efficacy of the electrical current in the treatment of certain nervous diseases. The molecular motion thus produced is of the most intimate and pervasive character. To the inert and almost lifeless particles of protoplasm it imparts new modes of motion out of which it becomes easier to bring a new equilibrium of forces which shall more nearly conform to the normal than to the pathological adjustments which

had been established. The peculiar efficacy of mercury and of iodide of potassium in the treatment of these diseases is justified by such considerations. The researches of the chemist have illustrated the astonishing diffusibility of these substances, and the experiments of the physiologist have taught us their remarkable affinity for the molecules of protoplasm. It is these special modes of energy which render them so valuable in the treatment of diseases. They pervade every nook and corner; they quicken every process of exchange and of elimination; they make room for the introduction and disposal of unlimited stores of nutriment. In this connection it is no more than right that we should commemorate the virtues of cod-liver oil, an aliment without which the effectual treatment of chronic nervous diseases is almost impossible. Of the working tissues of the body none require so large an amount of oily food as the brain and the nerves. Therefore, when you would restore a worn-out nerve, it is as needful to supply with the other food a large quantity of easily digested fat as it is to be liberal with bricks and mortar when you would rebuild a dilapidated wall. And, lastly, we must not forget to insist upon the supreme importance of rest in the treatment of these cases. I think it very likely that our patient, here, has at least delayed the progress of his recovery by the incessant activity of his life. Having experienced no difficulty in moving his limbs, he has jumped and played as hard as any of the other little boys among his acquaintance. Now this has no doubt been a very good thing for his digestion and for some of his muscles; but as a general rule, especially in the case of adult or aged patients, such incessant motion is too exhausting. In other words, the products of disintegration soon out-weigh the materials of repair, and the tissues become loaded with refuse beyond their ability to free themselves. The delicate structures of the nervous system may in such case be compared to

the machinery of a factory which is filling up with sawdust and shavings. If, under such circumstances, you wish to clean house most expeditiously, you must bank the fires, and stop the manufacture of litter until you have had time to sweep the establishment, and to oil the wheels all around. That is just what you do for the human body when you put your patient in bed, and keep him there until his recovery is well advanced.

## **OPERATION FOR CLOSURE OF CLEFT OF THE HARD AND SOFT PALATE.**

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**GENTLEMEN** :—During the past term we have had a large number of cases at our surgical clinics, illustrating what we early called your attention to—viz : the aid we can render Nature in curing surgical diseases.

To-day, I wish to speak of the equally important assistance that can be given Nature in curing her defects.

The subject is Cleft of the Hard and Soft Palate. As you observe, we have some excellent cases to exhibit. This subject is one that has occupied the attention of the master minds in our profession, both in this country and in the old world, and each can claim a good degree of success. This is not the kind of a lecture to admit of our entering into the details of the history of the operation. It is enough to know that such men as Roux, Dieffenbach, Langenbeck, Pollock, Simon, and Sir Wm. Fergusson of the old world gave years of labor to the study of the proper manner of performing the operation, in order to bring about the best results; and that in our own country, no mind has towered above that of the excellent,

wise and good American surgeon, Dr. J. Mason Warren, of Boston, in the study and performance of the operation. As far back as 1843, by his published cases, he gave a stimulus to the study of the subject that has resulted in great good.

The operation has ever been a difficult one to perform; yet the desire to relieve so serious a deformity has been so great, that now, the exertions and successes of Fergusson and others, each of whose attempts seem to have advanced the operation one step nearer perfection, no longer leave room for doubt that it lies in the power of the surgeon to do more for the relief of these cases than can be done by any other method, artificial or otherwise.

In these two little patients whom I show you to-day, we have strong cases to illustrate the pathology, the definition of the lesion and its complications.

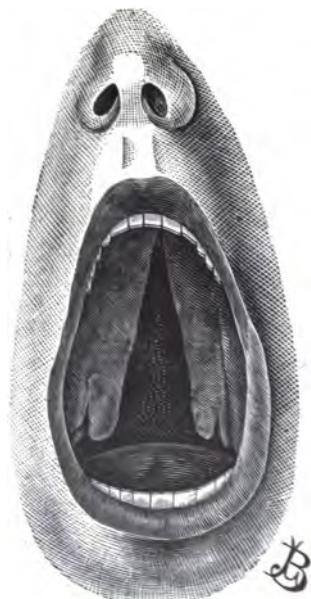


FIG. I.

Of the deformity known as Simple Harelip, you have had a goodly number of cases presented during the term, and I shall say but little upon the subject, except as it refers to the two cases before you.

By Cleft of the Hard and Soft Palate is meant that condition wherein there is a fissure, more or less extensive, of the bony roof of the mouth, extending posteriorly through the soft palate. It may be more or less complete, but generally extends through the entire structures as seen in this illustration from

one of my own cases. (See Fig. I.) The fissure in the hard palate may extend anteriorly through the center of the alveolar ridge of the jaw, or it may extend to the right or the left of the median line: it may so extend as to become a fissure on each side of the nose, leaving the intermaxillary bone in the middle as an island, as seen here in the case of this little boy. Again, it may be such as to include the vomer decidedly to the right or to the left, and thus, when well-marked, complicates the operation for bringing together the solid bone. This is a point you must bear well in mind, in doing what is called the Ferguson operation.

All cases of this deformity arrange themselves into two classes, either congenital or acquired, and this classification must be considered in deciding upon the kind of operation to be performed. Certain families seem to show a proneness to this deficiency, the deformity being transmitted from one generation to another, until as many as three generations have been known to be affected. Sometimes several children, two, three or four in the same family, will be afflicted as in the cases before you.

The lesion is plainly an arrest of development. Nature fails to do her work fully. She brings the parts up to a certain point and then stops, leaving the union of the two halves as originally intended, unaccomplished. Take for example this boy, aged five years. We have here a complete fissure in the roof of the mouth extending up into the nostrils, so that we can see the turbinated bones. The fissure extends anteriorly through the alveolar ridge on each side of the intermaxillary bone, so that we have the latter as an island protruding forward, and upward, presenting the most frightful kind of deformity, and one the most dangerous in the infant, from the great difficulty met with in feeding and sustaining life. Posteriorly, the fissure extends completely through the soft palate, splitting it into two equal portions. The vomer is carried rather more to the left,

and what is somewhat singular, the fissure in the angle of the soft parts of the nose extends much further up on this side.

Now observe the little girl, a sister of the boy, aged eighteen months. She has a cleft of the hard and soft palate almost precisely similar, only that it extends simply through the alveolar ridge near the left nostril, and is complicated with slightly double harelip. The mother says she has one child older than either of these and one between, both of whom are perfect. You may observe about the mother a slight depression in the vermillion border of the upper lip ; so sure was I that she had been born with harelip, that I asked her at once when she had been operated upon. I was wrong, however, in my surmise, and she farther told me that no ancestors, either of herself or her husband, had been known to suffer from this defect. It has been said that maternal impression has been the cause in some cases, and I find, on making inquiry, that this mother believes somewhat in this as the cause with her children.

These two cases have been brought here to-day for our advice, and if an operation is decided upon, to have it done. The children have been a great care to their mother. Although the boy now succeeds well in feeding himself, the girl or rather babe still requires a great deal of attention. Children born with this defect as you know cannot nurse, and in the great majority of cases must be fed for a long time from the spoon. In many instances the arrest in development of the organs of deglutination is so great, as to actually prevent the babe from swallowing sufficient food to sustain life, the serious disturbance to nutrition being frequently a cause of death.

And then as to the voice : Observe how difficult it is for this little boy to talk so as to be understood. The nasal tone is such, in fact the loss of voice is so great, as to prove a constant source of annoyance.

Children who are allowed to grow up with this deformily are

kept from society and from the study of the professions.

Of all the ills to which, through accident or disease, the human family are subject, there is scarcely any, in my estimation, that calls for more earnest, patient study on the part of the surgeon, for its relief. These two cases may be looked upon as true cases of congenital cleft.

Acquired cleft is where, through accident or disease, we have an opening of greater or less extent in the hard or soft palate. I shall speak of this farther on in our lecture.

A word as to the time of doing the operation as regards the age of the patient; also as to the associate complications. I have now done the operation sufficiently often to warrant my saying that, as regards age, the best time to operate is between the second and third years. At this age the child makes every effort to talk and, in so doing, acquires the nasal tone which afterward is so difficult to overcome. Therefore I believe in an early operation that the parts may be put in as good condition as possible for the use of the voice.

In regard to the complications of single and double harelip, I would say that, were it not that very young children bear the loss of blood poorly, it would be well, when operating for the cure of the above deformity, to also close the cleft in the hard and soft palate. But this is impossible, so we consider which operation shall precede in the cases before us. In that of the boy, were it not for the large intermaxillary bone that presents as a wedge, I should be inclined to operate for closure of the entire cleft and let the double harelip remain for a future operation. The mouth now gives us better space for working within than it will after the lip is operated on; but, on the other hand, there is an advantage in operating on the lip first, and that is, that, if successful, the sides of the fissure are brought nearer together. In view of this latter fact, we have decided to operate on the lip in each of these two cases to-day, and to

postpone the operation on the cleft for another year, when, in the case of the boy, all the good that the soft parts can do in approximating the fissure will have been accomplished ; and, in addition, in the case of the girl, what we consider the proper age for doing the cleft operation will have been reached. In this opinion, my colleague, Professor Ward, coincides.

The operation on the girl will be for simple harelip ; in the boy's case, we have more to give us anxiety and to exercise our judgment. In the majority of cases where we have this intermaxillary bone presenting as an island, it is better to preserve it and attach the lip to it on each side, after making efforts to press or bring it back on a level with the alveolar ridge of the upper jaw. When the harelip exists on both sides, my experience teaches me in operating that it is best to operate on only one side at a time ; but in the case of this boy, the island is so very prominent, and ossification so far advanced that we shall have to remove a portion of the projecting bony substance, having in it the two middle incisors of the temporary, and the sacs of the corresponding teeth of the permanent set, and will then be able to bring the soft parts of the lip directly together in one operation. As we shall do here, always save what you can of the skin and periosteum covering the island. As you observe, after loosening up these tissues, we remove the bony portion with the curved bone forceps, controlling the deep hemorrhage (which is sometimes very severe) by applications of ice, and then bringing the fissures together in the ordinary manner by use of harelip pins and figure-of-eight silk suture. This, you see, now after the operation, has had an effect to narrow the appearance of the face very much, and has already in a wonderful manner improved his looks.\* Perhaps it is well to repeat to you in connection with these cases what we have

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\* This patient made an excellent recovery and result.

already said when speaking of simple harelip, to operate as early as possible, possibly within a week after birth, not later than the end of the second month; this I would advise you to do upon the single or double harelip when associated with cleft of the hard and soft palate. If the operation is a success, it gives the child a better chance to take its nourishment, and brings the fissure as close as possible for operation at the time we have stated.

Now as to the steps in the operation for closure of cleft in the hard and soft palate. In a few days I shall be able to show you a girl aged five years, and a boy four years old, upon whom I have recently operated by what is known as the Fergusson method.

The accompanying drawings will illustrate to you the different stages of the operation. I am indebted to the kindness and artistic skill of my colleague, Professor Balch, for their truthfulness.

Briefly, concerning the methods employed by different operators, Roux aimed particularly to bring together the soft palate by paring the edges and then introducing the sutures. An improvement on his method was introduced by Dieffenbach, of Berlin, which consisted in relieving the dangerous tension upon the stitches by making linear incisions in the soft parts. This method was also improved upon by Professors Pancoast, of Philadelphia; Pollock and Fergusson, of London, and Sèdillot, of Strasburg. But the greatest advance that was made about this time in the performance of the operation, was by Dr. Warren, of Boston, whose improvement consisted in forming periosteal flaps, by dissecting up the periosteum from each side the cleft in the hard palate. He, too, was among the first to make use of the lateral incisions in the soft palate. Langenbeck used the periosteal flaps, making a more decided effort to close the cleft in the hard palate than did Warren, the latter being content to close the fissure in the soft palate.

and leaving the opening in the hard palate to be closed by the obdurator.

Fergusson, who now became the most earnest worker of any in this branch of surgery, by his dissections and investigations, conceived and successfully carried out the idea of bringing the bone itself together, by splitting it loose from the alveolar ridge, thus accomplishing what had been his aim, and that of many other surgeons,—the closure of the entire cleft in such a manner as to secure for the patient a perfect, solid and fixed arch, coming, as near as possible, to what Nature originally intended. This, the Sir Wm. Fergusson method, is what I wish to speak of to-day. He seems to have made the most decided progress of any modern surgeons, and, although innocently carrying out an idea advanced many years previous by Dieffenbach (without ever having been done by the latter, however,) has left us a record of experience in a list of over three hundred cases, and a knowledge how to do the operation for which we have great cause to be thankful. It seems scarcely necessary to advance any argument in favor of this operation, as compared with the use of the obdurator, (which has ever seemed a reflection on surgery in this particular,) when we consider how much greater is the relief afforded by a permanent condition, than can be given by a merely temporary one, as we must term the state the patient is in, when seeking a cure for congenital cleft by means of the obdurator. I would reserve the use of the obdurator for cases of acquired cleft only.

Dr. Warren was of the opinion that anaesthetic could never be given in this operation ; but it has been shown that chloroform is perfectly safe. Children come under its influence quickly, and you can begin the operation promptly, that is, it does not cause vomiting as ether does. Sir Wm. Fergusson was in favor of the use of chloroform, and gave it in his operations of this

kind. In keeping the mouth open during the operation a gag is employed. You see here what is known as the Wood gag. A modification called the Smith gag has simply in addition the tongue depressor. Here we have Fergusson's side gag and the Whitehead gag, invented by Dr. Whitehead, of New York. This latter is, I think, the best in use. Before the child is to

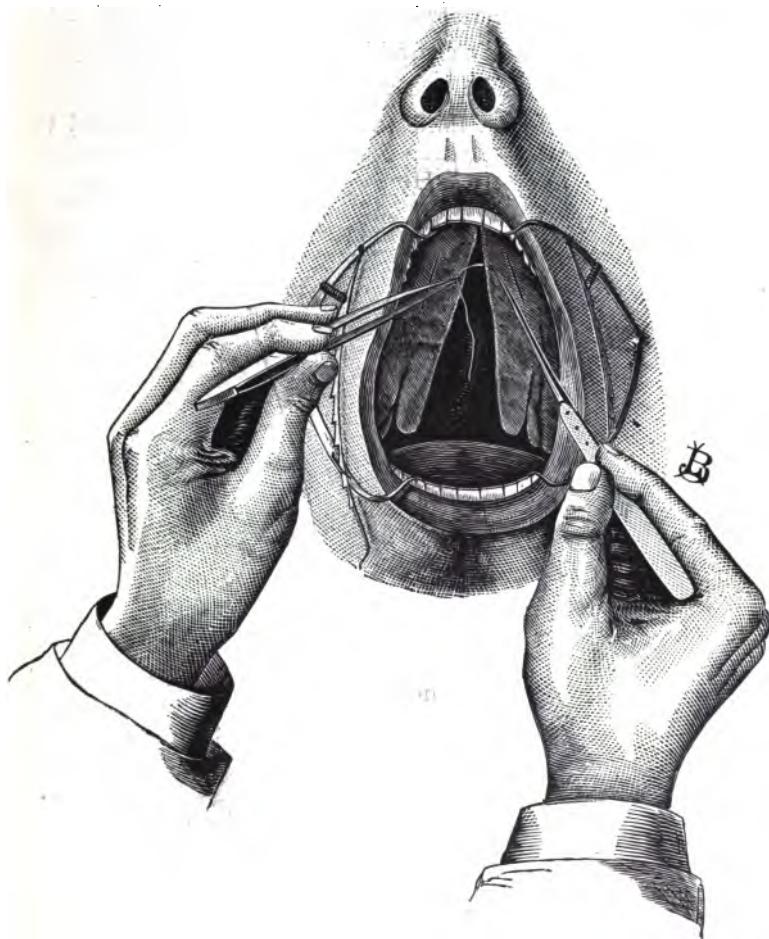


FIG. II.

be operated upon, directions should be given that no specially solid food be taken for a period of twenty-four hours previous. When the anæsthetic takes effect, the gag should be introduced as shown in the illustration. (See Fig. II.) You should have ready a number of sponges with at least a dozen good sponge-holders, long enough to reach well back in the pharynx. It is necessary too, to have a bowl of cracked ice near, in which to dip the sponges to use in controlling hemorrhage. You require as your assistants, one to give and faithfully watch the chloroform, one to sponge, a third to hand the instruments and to assist generally, and two good students to clean, dry and hand the sponges. I have found it convenient to operate in front of a good light, with a firm pillow under the patient's head; other operators have spoken very favorably of letting the child's head hang over the table, sponging the blood out as it collects in the posterior part of the pharynx. The essential steps of the operation are as follows:—

*First.* With an awl-shaped instrument, such as you here observe, holes are bored through the bone near the edge of the cleft, as seen in this drawing from life, (See Fig. II.) for passing the sutures.

*Second.* Similar holes, two on each side, are drilled through the bone along the alveolar ridge, sufficiently in front and not so far back as to interfere with the important blood-vessels, and then by means of the chisel you here observe, the parallel portion of bone is pressed or rather forced toward the median line, for the purpose of closing the cleft in the hard palate with bone and periosteal substance.

*Third.* The edges of the fissure and cleft are then thoroughly pared by means of the small straight knife and forceps, or by curved scissors.

*Fourth.* The muscles of the soft palate are then divided by use of the angular, spear-shaped knife, such as you see here.

*Fifth.* The blue and red silk threads forming the sutures are then passed alternately in the following manner, as seen in these illustrations : (See Figs. III., IV., V. and VI.)

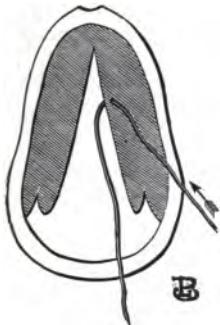


FIG. III.

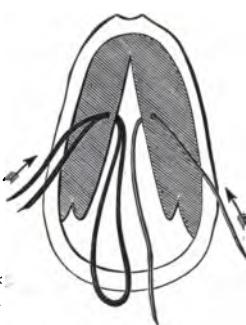


FIG. IV.

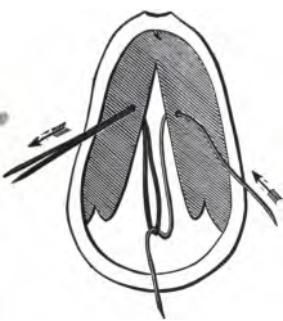


FIG. V.

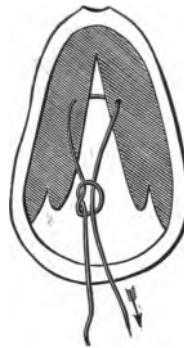


FIG. VI.

First, a blue thread is passed through the anterior hole previously made in the left side of the cleft, by means of the long curved needle, as seen in this drawing, (See Figs. II. and III.) the free end drawn out singly by long forceps ; next, a red thread is passed in the same manner through the hole opposite in the right side of the cleft, the loop being drawn through, and in this is engaged the end of the blue suture in order to draw it through the hole on the right side, thus completing its passage as seen in this drawing. (See Fig. VI.) In this way as many

sutures as are needed are passed, the red and blue alternating.

*Sixth.* Tying the sutures is next done by means of the slip-knot, in the following manner: a half knot is formed in one end of the suture through which the other end is passed, and then by use of the fingers only, the knot is pressed tightly down to the edge of the cleft, bringing it together, and tied twice, as may be seen in this drawing from life, (See Fig. VII.) thus closing the entire split completely in one operation.

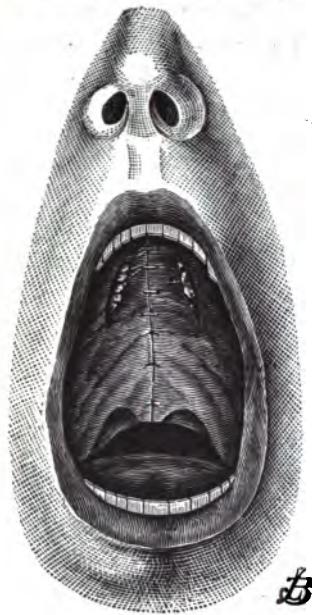


FIG. VII.

This last illustration shows you the roof of the mouth of the little girl whom I hope to show you in a few days, and which proved a success after the second operation. The knots of the sutures should all be brought to one side of the fissure and not left in the center, for fear of their working into the fissure and preventing union. This drawing also shows you the openings in the bone near the alveolar ridge made by the awl and chisel, stuffed with lint as is recommended by Sir Wm. Fergusson, he believing that it aids in keeping the parts in apposition. These

openings soon fill with granulations. The lint after the operation should be placed there with care, that it does not loosen and cause the patient to cough, and thus put the sutures too much on the strain.

Thus you have in detail the manner of dividing the muscles of the soft palate, together with the separation of the bone long and parallel with the alveolar ridge; a method which

has brought the operation where surgeons of the present day can with great confidence, assure the patient and friends of a complete success attending its performance. That more than one operation may be required in the same patient is quite true. I have known Sir Wm. Fergusson to operate as many as three times on one patient before complete success attended his efforts, and an average of two operations to the patient is quite the rule. Sometimes the opening left in the hard palate may be so small, as to be closed by sliding periosteal flaps, or by applications of nitrate of silver or nitric acid to encourage granulations sufficient; yet if the opening be of any size, it is better to split the bone a second time.

It is seldom you have any necrosis from handling the bone in this manner. In some cases there seems such a want of the soft palate, that various methods have been suggested for its increase or rather restoration. Perhaps the best is that of Simon's for the restoration of the voice, and if it proves a success, will be a great step in advance. His operation consists in bringing forward a flap from the posterior wall of the pharynx, the base downwards, the free end being turned over between the edges of the cleft in the soft palate, and sewed to them, the object being to prevent so great a volume of air escaping through the nostrils, which seems to give the nasal wang observed in speaking. For the restoration of the uvula an excellent operation has been suggested, and done, by Dr. Wm. S. Forbes, of Philadelphia.

As to the length of time required in doing the operation, you will seldom be able to do it in less than an hour, and often it will exceed this period. You should never commence giving the little patient the chloroform yourself, in fact, don't allow yourself to be seen just previous to the operation, as after it, it is desirable to not have the little one afraid of you. The mouth may not necessarily be examined for two or three

days after the operation, and then be careful and don't allow the patient to open it very wide. The stiches must be watched and removed anywhere from the fifth to the eighth day. In doing this, it is well to place the patient under the effects of chloroform, and to administer it, let the little one handle some fancy or gaily colored handkerchief on which chloroform has been sprinkled ; it takes only a little to bring them under, and this little manœuver will frequently prevent a crying fit. I am in the habit of letting patients take freely of fluid food after the operation, and allow them to play around the room.

In the removal of the sutures you will find the advantage of using the colored silk, as it can be better seen. The surroundings of the patient previous to and after the operation should be good. They must be free from any cough and not exposed to diphtheria or the dangers of croup. If there be an epidemic of any throat disease in the neighborhood, I do not hesitate to postpone the operation. Every opportunity should be given for early, prompt and primary adhesion.

One word more as to the disposal of the intermaxillary bone or island as we have termed it, in cases where it does not act too much like a wedge, and especially if you are anxious as to the narrowing of the face. In many cases by a previous operation it can be pushed back in place and made to come on a line with the upper jaw and lip. This operation consists in taking out a V-shaped portion of bone with the angular bone forceps, at the junction of the island with the vomer, then by sharp pressure breaking the bone down in position, and holding it there by means of compress and adhesive plaster. After this treatment has been continued for about ten days the bone will remain in place, and then when required you can go on and do the operation for relief of the harelip.

Perhaps I ought to say to you that in dividing the palato-pharyngeus, levator-palati and palato-glossus muscles of the

soft palate, it has been suggested to use the galvano-cautery knife, but as you do not always have this on hand, I would recommend you to rely upon the knife or scissors. Pollock laid great stress upon dividing the muscles near the hamular process. I believe you are safe in dividing them where the tension seems the greatest, also as to the incision in the posterior pillar of the fauces. In your incisions along the alveolar ridge, bear in mind the anterior and posterior palatine arteries which are to be avoided. In making these incisions it has also been suggested to use the galvano-cautery knife, and that in consequence of its not causing any hemorrhage, it is possible to do the operation on the babe. It is well for you to remember this. You may be called upon to do the operation on the infant, to prevent starvation.

Now while I believe the Sir Wm. Fergusson operation for cleft is the only proper and true treatment for congenital fissure, yet there are cases of acquired cleft, such as result from accident or specific disease, that can be treated only by means of the obdurator. And to American dentists is due the credit of having perfected this mechanical appliance. You have only to consult the latest works and periodicals on Dentistry, to acquire a full knowledge of its use. You remember in our early clinics to have seen two cases of acquired cleft, where the opening in the bone in the one case was quite large, both resulting from syphilitic necrosis. I may say that both of these cases have been treated by dentists of this city with the obdurator, and with perfect success. This is by far the best treatment for these cases. Where the cleft is the result of accident, as when for instance a boy falls on a bean-blower or some like weapon, cutting a sad gash in the roof of the mouth and an opening results, it is possible to make a better operation and one more permanent, by bringing together the periosteal flaps.



## ON THE TREATMENT OF THE VARIOUS FORMS OF ACNE AND OF ROSACEA.

BY R. W. TAYLOR, M. D.

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GENTLEMEN:—In our previous meetings you have seen fully twelve cases of acne, which is a skin disease of especial importance, as it occurs most generally on the face, and is annoying by reason of its persistence and recurrence. You will remember that for convenience of description I spoke of simple acne, characterized by papules and pustules, of a more severe form in which these lesions became much hypertrophied, known as acne indurata, and of a third form, in which, in addition to these lesions, there was a chronic and more or less extensive hyperæmia. This latter variety has been wrongly called acne rosacea, and if I call it hyperæmic acne, I do so simply because I wish to have a name by which I can briefly speak of the condition which requires a modification of the usual treatment of acne. The truth is that all are cases of acne and that they present varying features which are important in the matter of clinical description and in their indications for treatment. Rosacea is a disease unconnected, in its origin, with the sebaceous follicles, as we shall presently see. Besides these conditions you have seen certain minute conical elevations of the skin with minute dark apices which are called comedones, and certain but slightly elevated and in general very small oval

yellow tumors, which are termed milium. In former years authors made numerous subdivisions of acne which are wholly unnecessary, as they simply express varying phases of the same affection. As we see the disease it presents generally two well-marked lesions, papules and pustules. In some cases you have seen nothing but papules, in others a commingling of these lesions with pustules. As I have already said, these lesions depend on inflammation and cell increase which begins around the sebaceous follicle. The papules vary very much in size and elevation, some being small, others so large that they can be grasped between the fingers. Their color is always red, which varies according to the age of the papule. The pustule is simply the same hypertrophied follicle in which the inflammation has been so intense that pus has been formed. These also vary in size, and in the amount of pus they contain.

Let us now study acne. You will remember that the cases shown you have been chiefly of young girls whose faces were free from any disfigurement until they reached the ages of 14 or 15, and that we have seen it in young men who said they were free till they reached the age of puberty, and, further, we have seen it in persons between 20 and 30, in some of whom it began at puberty, and others some years later. You will remember that several young women were questioned carefully as to whether they had any menstrual derangement, and that they pronounced themselves perfectly healthy, again two complained of irregularity in their menses, and several were anaemic and one positively cachectic. Then in the one or two males presented to you afflicted with acne, there was no appreciable deviation from health. Let me here say that I do not believe that acne is ever produced by masturbation, though such a belief is entertained by many of the laity, much to the chagrin very often of innocent young men. As we have found acne to be an inflammation of the sebaceous follicles, the

question arises, what is its cause? This we can only learn by carefully studying the course of the disease, and in determining the condition of those afflicted by it. I think that in by far the majority of cases, acne begins in male and female subjects just about and during puberty. Now at this time we know that certain developmental changes take place by which their whole being is altered. Among these changes we note a very rapid maturity of the female, a less rapid one in the male. In the latter there is greater hyperæmia of the sebaceous follicles of the face, and in the female a recurring afflux of blood to the organs of generation. In many cases of acne in young men I think that the trouble is due to the fact that a physiological hyperæmia becomes pathological, as the disease in many ceases when the beard is fully developed. In the female there is not this direct hyperæmia to the follicles of the face, but there is established in them at this time a great change in their circulatory system, and coincidently we observe a tendency to hyperæmia around the sebaceous follicles of the face and perhaps back. This is as far as I can go without indulging in too much theory in trying to determine the ultimate cause of acne. Let us now take certain of our cases which are typical and draw from them the indications for treatment. In some you will be able to find no cause for internal medication whatever, no debility, no gastro-intestinal trouble, no abnormality of function whatever. In such cases you will of course follow local treatment fully, but if the disease is persistent, as it may be, you will often produce a cure by giving certain remedies which you will, I am sorry to say, prescribe in an empirical rather than a rational manner. Particularly in those cases in which there is much irritability and hyperæmia complicating the acne you will gain good results by administering alkalies over a long period of time, say at least two months. You may use either the bicarbonate, citrate or acetate of potassa. My favorite formula is as follows:

Rx

Potassæ acetatis . . . . .	℥ i.
Syr. zingiberis . . . . .	℥ ij.
Aquæ . . . . .	℥ vij.
Mix.	

One tablespoonful three times a day an hour after meals in half of a wineglass of water.

I can speak with positiveness as to the efficacy of this treatment as I have watched its action in many cases in a very critical manner. It is true that it is not a specific, still in some cases it may yield to you good results. You will always bear in mind that the iodide and bromide of potassium are contraindicated in cases of acne, as these drugs have a tendency to induce hyperæmia of the sebaceous follicles. Reasoning on the fact that at certain European mineral springs some cases of acne have been benefited and cured, I have been led to persist in the prolonged use of alkalies. In some cases, both in young subjects and in older ones, I have in addition to the potash salts, prescribed Rochelle salt, more particularly in cases in which there is constipation. A favorite prescription, and one capable of extended use in very many other conditions, is the following :

Rx

Potassæ acetatis . . . . .	℥ i.
Sodæ et potassæ tart. . . . .	℥ ij.
Syr. zingiberis . . . . .	℥ ij.
Aquæ q. s. ad . . . . .	℥ viij.
Mix.	

This may be given in the same manner as the former. It may happen that slight purgation is induced at first, if so the dose may be made less or it may be taken but twice daily. Very soon it can be taken regularly three times a day. The benefit of this treatment is especially to be looked for in those

cases where the disease, whether limited or extended, recurs with exasperating frequency. You must remember the necessity for its continuance, as the condition it is to remove or modify is decidedly chronic. Another remedy of very great value, in chronic cases especially, and in those patients in whom you find no constitutional vice or any abnormalities of health, is arsenic. I think that we have of recent years failed to appreciate the full value of this very potent remedy. I have not time now to consider fully its probable mode of action. Owing to its direct tendency to stimulate the cutaneous capillaries, it is especially valuable in cases of chronic hyperæmia with increased cell growth. This is what we have in acne, at least this is the pathological process we actually treat. We want to remove the hyperplasia around the follicles, with its co-existing hyperæmia. Arsenic must not be given in cases in which the hyperæmia is very marked, but on the contrary, when the whole aspect of the case shows that it is a subacute condition. In acute cases (in the sense now understood) it may be necessary to use the alkaline treatment just described before the use of arsenic is commenced. In using arsenic you must watch your cases carefully. My rule is not to consider myself responsible unless I see the patient at least every five days. I begin by ordering for an adult five drops of Fowler's solution three times a day, well diluted in water. There are other preparations of arsenic, but I fail to see in them any advantage over the solution I speak of. Let it be your rule never to trust the solution itself in the hands of the patient. Prescribe the remedy well diluted. I generally at each consultation prescribe a two ounce mixture, which, containing just sixteen teaspoonfuls, is used in about five days. To begin with you will order then five drops of solution three times a day ; the following being a very pleasant and proper formula :

R

Liq. arsen. Fowleri	gtt. lxxx.
Syr. aurantii	
Aquæ	aa. $\frac{5}{3}$ i.
Mix.	Dose one teaspoonful.

Taken about an hour after meals in half a wineglass of water, this mixture will generally not disagree with the stomach. The ultimate dose reached will vary in different cases. In some a cure is effected when you reach ten drops, and even less, but you may have to run up even to twenty drops. There is in some persons a remarkable tolerance of arsenic, so that to produce good effects you have to use a larger dose. If the remedy is carefully increased and kept up, it will soon begin to produce a change in the papules on the face or back. They will in about a week appear rather redder than usual, and often the patient thinks that his condition is materially worse. But under favorable circumstances, generally to be expected, the redness gradually fades, the lesions shrink, flatten and disappear. If the redness increases persistently with the increase of the dose of arsenic, it is well to drop it for a time and to go back to the alkaline treatment. In this connection I may add that you can often prevent or cure the acne which follows the use of the iodide of potassium, by giving with it or in a separate dose five drops of Fowler's solution. Generally this quantity is all sufficient, but of course it may be increased.

Arsenic may also be used in the form of natural mineral waters, if obtainable, and by preference taken at the springs. I call to mind a very severe case of papular acne, which was much benefited by the French natural arsenical water, called *eau arsenicale de la Bourboule*. As to the use of our own natural waters in the cure of acne, I cannot speak with much positiveness; but I am inclined to think that our natural aperient and diuretic waters may be of benefit, if taken for sufficiently

long periods. In some cases, particularly if the patients have acidity of the stomach, arsenic may be combined with the alkalies with beneficial results. This general outline of treatment by alkalies and arsenic may be used in such cases as we see before us, of this young woman, who seems in perfect health, but whose acne has resisted intelligently directed local treatment. But there are cases in which alkalies are actually indicated; indeed, such we have seen. If there is scanty highly colored urine, if the patient has slow flatulent digestion, is subject to the general condition known as sub-oxidation, or has a tendency to rheumatism or gout, and to various ephemeral congestions, these agents are absolutely necessary. In some cases of anaemia iron may be beneficial, either given alone or in combination with an alkali.

Let us take the case of this young girl: she is sick in no other way than to complain of weakness. Examined carefully, the skin of her face is seen to be very coarse, as if the elements composing it were less refined than usual. It is of a dirty color, minutely uneven, with large orifices of the sebaceous glands, many of them plugged with small particles of dirt. See the great number of pustules as compared to papules, and the very large number of comedones. I have noticed in this class of cases, who possess, as I have termed it heretofore in my lectures, a degraded skin, a great tendency to acne, which develops at an earlier age than in others, and you will see it yourselves if you look for it. These cases are, in my judgment, examples of a naturally abnormal skin. You will find that the subjects of it come of a family who have a history of bad health. Such cases can be much improved by alkalies, iron and arsenic combined. For this girl I would prescribe all of these remedies, and order plenty of out-door exercise and good food. But especially would I look after the local treatment, which must be decidedly stimulating. This we will consider further on.

I have yet to show you this case of what we call acne indurata. You will notice a variety of lesions on this woman's face. She has suffered from acne for twelve years; she is now twenty-six. You see many papules, of various sizes, some capped with a little pus crust. There are also numerous white cicatrices, some round, others irregular. You may see by the appearances presented, and the woman states the fact, that these papules and pustules appear and grow very slowly. Around some there is more hyperæmia than around others. You notice that they attain a considerable size, differing in that particular to all the other cases. Here are a number of papulo-pustules which are distinctly prominent, and which, when grasped by the thumb and fore-finger, feel deeply seated in the integument like a small furuncle. The history of these cases is always that they are very chronic and persistent. The pathological condition at the bottom of it is, that the cell increase is very great and compact, and that these new inflammatory cells ultimately undergo fatty change and are absorbed, taking with them part of the cell frame-work which they have infiltrated. You will find that in such a case as this, even the prolonged use of alkalies will yield almost insignificant results. In these cases there are two remedies besides the local, upon which you can place much reliance. These are arsenic and the bichloride of mercury. By preference I would employ the bichloride in this case, feeling confident that I should have good results. In several such cases I have given this remedy for fully four and six months. A case comes to my mind of a rather thin woman, a descendant of a tuberculous family, who having had for ten years acne indurata, was cured by the bichloride, which she took for fully six months. I generally begin with the thirty-second of a grain, given in a bitter fluid. My favorite formula is—

**R**

Hydrarg. bichloridi . . . . .	gr. i.
Ammoniæ muriat . . . . .	gr. vi.
Tinct. cinchon. co. . . . .	ʒ iiij.
Aquæ . . . . .	ʒ i.
Mix.	

One teaspoonful in a wine glass of water, three times a day, an hour after meals. The dose can be increased every ten days until you reach in general one-quarter of a grain. The effect of this treatment begins in about two or three weeks, and it seems to have the two-fold action which arsenic so often has, (unfortunately not invariably) that while it causes existing lesions to disappear, it seemingly prevents the formation of others. Having been struck with the marked value of this remedy in these cases, I enquired as to whether there was any syphilitic or strumous tendency in the cases, and found none. Certain of the women were anaemic, one only, a widow, gave a history of having had miscarriages, and having given birth to a macerated foetus; but she herself showed not the slightest evidence of syphilis. In such cases, iron and tonics may be combined with the mercurial. When you wish to combine arsenic and the bichloride of mercury, and I should, knowing the action of arsenic, recommend it as a valuable adjunct in these often obstinate cases, you may use De Valangin's solution, which, containing the chloride of arsenic, is not incompatible with the mercuric bichloride. The dose of De Valangin's solution is the same as that of Fowler's solution.

As patients increase in years, you will notice that in them acne tends to become accompanied by a more or less diffuse hyperæmia. It is not common to see simple papulo-pustular acne appear in a subject of thirty and over, unless as the result of some medicine taken or applied. You have

seen before you marked examples, in men and women, of acne with much hyperæmia, which is wrongly called acne rosacea, and you have seen patches of localized redness of the nose and cheeks chiefly, without any perceptible glandular affection at all, which is rosacea. As the treatment of these two affections is very similar, I consider them here together; but I wish you to observe the difference thus plainly stated.

These cases of both kinds may occur frequently to you, and they will often tax your therapeutic resources severely. You can do much by the general internal management of them and more by vigorous local treatment. Let us consider the internal treatment. If the affection is caused by plethora, and you will meet with cases in which you can find no error in the general nutrition, but simply an increased vascular tension, especially of the superficial vessels of the face, it may be much benefited by frequent catharsis and by the continued action of diuretics. I need specify no particular cathartic except that it is always better to use one in which there is a moderate quantity of calomel or blue pill. The depurative action of mercury combined with some brisk cathartic like aloes, or the compound extract of colocynth, is often very striking, in relieving the persistent redness and diminishing the tendency to the frequent flushing of the face which occurs so often in these cases, and constitutes a great source of annoyance. In using cathartics in these cases, you must order them to be taken frequently and continuously. You will soon learn by their action how often they are required. In general, two doses weekly may be given, seldom more than three. I, of course, presume that they are borne well. At the same time alkaline diuretics are very necessary. The potash salts already spoken of are excellent and will produce good results, provided you continue their use for a long period. For in these cases you have an es-

sentially chronic affection to treat. I am convinced that many physicians, who say that acne and rosacea are so stubborn, and even rebellious to treatment, have been led to that conclusion by failures due to an insufficient treatment. They have tried the remedies a few weeks and stopped. In such cases besides the remedies now suggested, certain of the active diuretic and aperient mineral waters will often be found to be useful, and for a time will pleasantly replace the customary prescribed dose which often becomes tiresome. You will do well to remember this point in the treatment of some of your cases, as a sojourn at one or other of our principal springs becomes a pleasant change for some patients. I have not the time to consider the subject of natural mineral waters any further, and I can here only allude to the subject. I am fully convinced that much benefit will result from the use of these waters in acne and other skin diseases. A point here suggests itself : Be careful in sending acne patients to the seaside, as the sea air is often highly irritating to the affection ; luckily our thermal springs are at a distance from the seashore. I call to mind a lady almost, if not entirely, cured of acne, in whom during a two week's visit to the Isles of Shoals, the affection appeared in a most aggravated form. As to the quantity of the diuretic salt, I would say that for an adult thirty grains three times daily, will suffice for a month, and that it may be increased ten grains each succeeding month.

While I thus strongly recommend a continued treatment, do not from my remarks infer that it will be almost interminable. Such is not the case ; still in some instances, particularly in those of long standing, of acne or rosacea, several months may elapse before the patient is thoroughly cured. In those cases in which there is such marked hyperæmia, always remember that arsenic is contraindicated, and further, that the iodides and bromides will aggravate your case. Be especially

careful to avoid the iodide of potassium. I thus warn you for the reason that in certain of these cases in which there is a gouty complication, you may be led to employ it. Of course, there may be urgent reasons why, in spite of the facial hyperæmia you have in such cases to use the remedy for the general condition ; in that event, the local trouble becomes secondary to the general one. Besides this purely medicinal treatment, there is much more which may be done for the patient's relief which I will speak of a little further on, when I have considered those cases which are complicated with certain morbid conditions.

I would not properly present this subject to you if I left you with the impression that in all simple and uncomplicated cases a plethoric condition of the system existed. I say simple cases, as I mean those in which there is no underlying morbid state of the system, which you can discover. Almost as frequently as you find hyperæmic acne and rosacea in a plethoric person, will you see it in one who is debilitated and anæmic. Thus you see the necessity of determining by close study the exact condition you have to treat. In these patients you will of course not employ cathartics and diuretics too vigorously, though these agents are necessary in these cases. They require occasional cathartics and are benefited by alkalies combined with iron, and sometimes with arsenic. The formula which I employ is—

## ℞

Potassæ citratis . . . . .	ʒ i.
Ferri et quin. cit. . . . .	3 ij.
Syr. aurantii . . . . .	ʒ ij.
Aquæ . . . . .	ʒ vj.
Mix.	

One tablespoonful three times a day an hour after eating.  
The indications for the use of arsenic are judged of by the

condition of the hyperæmia. If, on pressure with the finger tips, the exsanguinated parts slowly become red again, and are not excessively hot, arsenic may be tried, using it in combination with the remedy just mentioned, and increasing its dose as the progress of the case indicates.

I have used in some cases, in addition to these agents, cod-liver oil, which is often of value in acne of any form in which there is debility. Let me here emphasize this fact. You will often, particularly in the young and those reaching puberty, see marked results from its use. You will remember the striking change in the girl shown some weeks ago, not only in the affection, but also in the appearance of the skin, from presenting a dull, earthen, dry look, it became white, soft and delicate. In all of these cases therefore in which there is debility, I rely for internal use on alkalies, iron, arsenic and cod liver oil. You may have read of the claims made for glycerine in acne, but I cannot endorse them, and I have given the remedy a fair trial.

In many women this rosaceous affection, existing or not with acne, undergoes exacerbations at the menstrual epoch, at the menopause, and often markedly during pregnancy. It is claimed that acne and rosacea are caused by uterine complaints, but I cannot fully endorse the assertion. You will find, I think, that these affections act only as modifying influences either by reflex action or by their disturbance of the general circulation, causing as they often do the most peculiar local hyperæmia. After a long and unprejudiced study of this question, I am fully convinced that uterine disorders are never the essential cause of any form of acne. Rosacea perhaps, like other hyperæmia, may be thus originated, but I think that where there is inflammation of the sebaceous glands of the face, it will be found to have existed prior to the abnormal state of the genital organs. When such modifying and aggra-

vating causes exist in cases of acne, they require particular treatment, which you will learn elsewhere.

The other conditions, which not infrequently underlie and act as predisposing or exciting causes to hyperæmic acne and rosacea, are that error in nutrition, which we term sub-oxidation, and the gouty and rheumatic habit. Those cases in which sub-oxidation exists, with its dyspeptic troubles, acidity of stomach, diminished secretion of urine, and increased quantity of uric acid, require more especially alkalies, of course the potash salts, which should be given for a long time. Other remedies for the concomitant symptoms will, of course, suggest themselves, and need not be enumerated. For the gouty state also alkalies are the chief requirements, with other appropriate agents. In treating hyperæmic acne you must remember that it is very largely influenced by the general condition, which should be carefully studied and improved in every particular. In very many cases, not only of this form and of rosacea, but also of eczema and psoriasis, in which there was an underlying condition of sub-oxidation and gouty habit, I have seen very much benefit derived from a treatment which was suggested to me by the late Professor Boeck, of Christiana. The patient is ordered to take, half an hour before meals, from ten to fifteen grains of the chlorate of potassa, dissolved in a wine glass of water, and half an hour after each meal from fifteen to thirty drops of dilute nitric acid in the same quantity of water. Beginning with ten grains of the chlorate potassa, you may increase by five grains until you reach thirty grains, and you increase the dilute nitric acid in the same manner. Professor Boeck explained the action of these agents thus administered and combined as principally furnishing an increased quantity of oxygen to the blood, or to the processes which go on to its formation. This perhaps may be the correct explanation, but I cannot say so positively, but I can say that I have seen some remarkable

results in the improvement of the general health and in the relief of obstinate cutaneous affections by the use of the treatment for a month or two. I would suggest for you to bear it in mind when you meet these cases. Such is a general sketch of the internal therapeutics of these affections. You can also do much by general attention to hygiene. Fresh air and out-door exercise are very important. Care as to diet is an essential. In very many cases of acne, especially if hyperæmia coexists, you can expedite the cure by causing the patient to avoid, as much as possible, starchy food of all kinds. I need not enumerate them, suffice it to say that such have a tendency to induce flatulent dyspepsia, and tend to production of uric acid in excess. The diet should be mixed, containing a minimum of the starchy articles. Fruits are beneficial. Alcoholic and malt liquors greatly aggravate, and sometimes indirectly cause rosacea, therefore they should be wholly avoided. Finally all sources of irritation of the face, either by minute acrid particles which may float in the air, as in certain businesses, direct applications to the face, such as cosmetics, etc., extreme heat of the sun or intense cold, should be avoided as much as possible. Such being the general outline of internal treatment and hygiene, let us now consider the topical treatment, for by it much can be done towards hastening the cure.

Let us first consider papulo-pustular acne, commonly called acne vulgaris. This patient I now show, aged eighteen, presents a typical example. Over the face chiefly, about the nose, cheeks and forehead, and less on the chin, are numerous bright red papules and pustules; where copious, there is hyperæmia between them. The question arises, what pathological indications have we to treat? They are simple, namely, to relieve hyperæmia and to cause absorption of cell proliferation, which is not however in large patches, but more or less scattered. These are the essential indications. The secondary ones are

to cause a healthy action of the sebaceous glands, and to prevent their future inflammation. If you read the various textbooks, particularly the older ones, you will be bewildered with the great number of remedies proposed for acne. I shall not, therefore, give you a categorical list, but shall only mention such as I have found to be beneficial after a full trial of nearly all recommended. Such a case as is here presented requires care and patience in the use of remedies. It is always necessary to impress on these patients the importance of carrying out the directions for treatment given to them. These require much care, time and trouble. Unless you can prevail on them to follow minutely your directions, it is useless for you to begin treatment. I am thus emphatic, as I very frequently see patients who claim that such a colleague has not benefited them, whereas the truth is they have done little to benefit themselves. Much of the discredit which is attributed to physicians in the treatment of acne, is due to two causes, first, either that they are not sufficiently careful, precise and emphatic in giving the directions for treatment; or secondly, that these patients only carry out their directions in an imperfect and indifferent manner. I always give patients to understand that unless they do what I direct them to do, to the letter, I am not in any way responsible for their cure. Now then for the directions: In such a case, typical of a very large class, you wish to check hyperæmia, and cause absorption. To this end you should direct that every night the patient should bathe her face with water as hot as can be borne. Hot water, containing half an ounce of powdered borax to the quart, is preferable. This should be sopped over the morbid parts for at least twenty minutes each night, and the face exposed to the steam. In slight cases this preparatory local treatment is sufficient, but in obstinate ones you must use other stimulant applications. Take, for instance, the case of this girl, who besides having

the acne like the other one, has a dirty looking skin. You see large open follicles, some with a minute particle of dirt at their apices, others slightly elevated, though not red. You see also numerous comedones, and over the skin a greasy appearance. Withal you notice a solidity of the papules, and an appearance of chronicity. Such a case requires more than hot water ablutions. Various soaps are recommended for such cases, the ordinary family washing soap, and even soft soap, are mentioned; but I prefer to these the German green soap. You can use this in its natural state, or in the form of tincture. The latter is more elegant. If you use the soap itself, you order the patient to make a small pad of flannel to wet it, smear it with soap, and then rub the parts steadily and firmly for fully ten or fifteen minutes. The effect is to induce much redness and a sensation of heat. After an energetic soap friction, you can use the hot water as directed. If, however, you use the soap tincture, you will have it prepared by adding one part of green soap to three parts of cologne. When well mixed, they are to be strained, and you have a very elegant preparation. I have used it repeatedly, with great satisfaction.

Taking a flannel pad, previously well moistened, you pour a small quantity of this tincture upon it, and then rub the face briskly. When that operation is finished, bathe well with the hot water. When soap is used, there is no necessity to add borax. The immediate effect of this treatment is to cause the face to look much redder. Therefore it is well to forewarn the patient, but at the same time give him or her the comforting assurance that the condition is but temporary, and that improvement will soon follow. No absolute rule can be laid down as to the frequency of these applications. Some cases are benefited by their use twice a day, others if used once; other cases again will not bear the soap frictions every day even. You will, therefore, watch the progress of your case

carefully, and adapt the stimulant to its necessities. In very many cases you will find that hot water applications and soap frictions are sufficient, but if they are not, there are other remedies which you can use, which are more stimulating. Thus upon your flannel pad you may sprinkle a quantity of finely powdered pumice stone, and with that make your frictions, or you may use very fine white sand. The latter was recommended years ago, and has again been proposed recently, after having been nearly if not quite forgotten. The cases in which it is necessary to use pumice stone and sand are more particularly those in which the skin is very rough, oily and coarse, in which there is great sluggishness in the course of the acne lesions, and in which there are many comedones. Though there are soaps made containing pumice stone and sand, I have found them of no practical use. You will bear in mind then these agents as being particularly serviceable in many instances. It is because these acne cases present so many phases, and are not amenable to any particular mode of treatment, that I am thus compelled to speak of so many agents.

Then again, gentlemen, cases will present themselves in which even this active treatment will not be sufficiently stimulating, and then you have a remedy in caustic potash or soda solutions, which will answer almost all purposes. The cases I refer to are those in which the cell increase, is very copious, profound and chronic, and in which you feel nodules of varying size and great firmness. In using these highly caustic solutions, you must enjoin great care. The solution you order will vary according to the case. In some instances from five to ten grains of either caustic soda or potassa to the ounce of water is sufficiently strong, but it may be found necessary to use them stronger, even as high as thirty or sixty grains to the ounce of water. When employing these strong solutions, care must be exercised that only the morbid parts are touched, and

for that purpose you use a small piece of sponge, tied on the end of a pen holder. While making the hot water applications, the patient presses this sponge, well saturated, to the parts, until a decided sensation of heat is produced. If you use a mild solution, it may be allowed to dry in the skin, and the parts thus remain for half an hour, until the further lotions or ointments are applied. But if the strong solutions are used, the surface must be quickly washed. These applications are for use at night, and their object is a temporary stimulation. They are only a part of the treatment, yet, in very many cases, an indispensable one. The frequency of their repetition must be decided by circumstances. Having made these applications, the patient is then directed to use certain lotions or ointments, as the case may require, which are to remain on the parts all night. Taking the simple case first spoken of, you order a lotion to be freely sopped over the morbid parts. The most efficacious lotions are those, the basis of which are sulphur or mercury. My favorite formula is as follows :

<b>R</b>		
Sulphuris loti	.. . . . .	3 iiij.
Spts. camphoræ	.. . . . .	3 iiij.
Sodæ biborat	.. . . . .	3 ij.
Glycerinæ	.. . . . .	3 vi.
Aquæ ad	.. . . . .	3 iv.
Mix.		

This should be well shaken, and applied freely, so as to leave a thin film of powder over the face. Certain cases, however, may not be improved by this lotion, and then one containing the bichloride of mercury may prove more successful, such as :—

<b>R</b>		
Hyd. bichloridi	.. . . . .	gr. iv. to vj.
Amm. chlor.	.. . . . .	gr. vj.
Aquæ colon.	.. . . . .	3 i.
Aquæ	.. . . . .	3 iiij.
Mix.		

This also may be freely sopped over the diseased parts of the

face, and allowed to dry on. Not only can this be used at night, but often during the day. Many of the books recommend the addition of emulsion of sweet almonds and tincture of benzoin, but I see no reason for them, as their action is at best very feeble. The cologne has a moderately stimulant action, which may be increased by the addition of from two to four drachms of spirits of camphor. Now it may be necessary after the hot applications or the frictions, to use decidedly mild and astringent lotions as these just mentioned are sometimes not beneficial. In that event you can prescribe one of the following, which are very soothing. The mildest is as follows :

R		
Calaminæ . . . . .	3 iiij.	
Bismuth. subnit. . . . .	3 ij.	
Acidi hydrocyan. dil. . . . .	3 i.	
Aquæ . . . . .	3 iv.	
Mix.		

This must be well shaken. One slightly more stimulating, but still mild, and called for in cases of much heat and redness, is :—

R		
Zinci oxidi . . . . .	3 iiij.	
Bismuth. subnit. . . . .	3 ij.	
Spt. camphoræ . . . . .	3 iv.	
Aquæ . . . . .	3 iv.	
Mix.		

Also to be shaken.

In the treatment of acne, we cannot avail ourselves of the stimulant action of tar, therefore we are forced to use chiefly camphor or carbolic acid. The latter agent may be used in combination with any of the lotions mentioned, but care must be taken in its employment. I think that from ten to fifteen drops of the fluid carbolic acid to each ounce of the lotion is as strong as it is prudent to use it. I have ordered it in place of the spirits of camphor in the compound sulphur lotion, and I

am satisfied that its action is beneficial. Though my experience with thymol as an ingredient in lotions for acne is as yet not extensive, I am disposed to think that it may be of benefit. In cases requiring mild stimulation, you will find that the following combination worthy of trial :

R		
Potassæ fusæ	grs. x.	
Thymol	grs. xx.	
Glycerinæ.	3 iv.	
Aquæ	3 iv.	
Mix.		

This may be used at night and during the day also. If its action is too stimulating, the skin may be rubbed with vaseline. In two cases this lotion acted very efficiently. I am unable to say anything at present as to the use of chrysophanic acid in the treatment of acne. Its color is objectionable, and its highly irritant action will necessitate its very cautious use. These are the principal lotions for the cure of acne. They are mostly to be applied at night, for obvious reasons, though certain of them may be applied during the day. Sometimes the use of lotions at night leaves during the day a feeling of tension and dryness of the skin, which is readily relieved by a very slight application of vaseline, cold cream or almond oil. Besides these, there are many ointments, some of which have been very efficacious. For patients in whom there is much hyperæmia, I have found the ordinary zinc ointment of much benefit, used at night after the preparatory treatment. It may be used in its simple state, or with the addition of from ten to thirty grains of camphor to the ounce, or again a slightly stimulant action may be introduced in combination with its astringent effect by adding ten to fifteen grains of carbolic acid to each ounce. Then again, you may derive benefit, as I have, from using the following ointment :

**R**

Hyd. sub. mur.	:	.	.	.	.	.	.	.	.	.	.	gr. xxx.
Acid carbol.	:	.	.	.	.	.	.	.	.	.	.	gr. xii.
Pulv. camph.	:	.	.	.	.	.	.	.	.	.	.	gr. x.
Ung. simplicis.	:	.	.	.	.	.	.	.	.	.	.	3 i.
Mix.												

In applying ointments, care must be exercised in rubbing them in thoroughly and in leaving a sufficient coating on the parts, well spread on lint. Passing now to a class of cases which require more stimulation, you employ ointments containing other mercurial preparations. A diluted citrine ointment (3 i. to 3 ij. to 3 i.), perhaps combined with camphor, will sometimes be useful. In very obstinate cases, the bin-iodide of mercury, gr. ii. to vi. to the ounce of simple cerate, with or without one of the stimulants, will be called for, or again, the proto-iodide of mercury, gr. vi. to xii. to the ounce, may be used. Of course, their application is to follow that of the hot water and soap frictions, though they also may, in some cases, be used during the day without preparatory treatment. A decidedly stimulating ointment is made by adding ten to thirty drops of the liquor hydrargyri pernitratris to the ounce of cerate. This ointment I regard as very valuable, and in rosacea and acne, I have used it in greater strength, by continuous application to the parts, with marked good effect. I could go on indefinitely enumerating ointments, but I have already pointed out the chief ones. I might add, however, that in some cases, a mild white precipitate ointment, gr. vi. to xx. to the ounce, has worked well. To these, also, stimulants may be added. Sulphur ointments, also, have been highly recommended. The ones most frequently used are formed of lac sulphur, gr. x. to xx. to the ounce, or the iodide of sulphur, gr. ii. to vi. to the same quantity. For use upon the face, I prefer as a basis of ointment, equal parts of the officinal simple cerate and cosmoline or vaseline, as the former is rather too hard, and while

thus combined it is unctuous and easily applied. They should also be fresh and smooth in consistence. It is necessary, in some cases, to add an agreeable perfume.

To obtain good results from any form of mercurial ointment, considerable friction must be used in order to rub it well in, for many cases of failure are due to their improper application. All of these ointments may be used in acne and in rosacea; in the latter, however, they should be in general rather stronger, and their use may be supplemented by other means. Our armamentarium is not, however, exhausted in this long list of remedies. I am in favor of incision of many, if not all, of the papules or pustules, especially if they are large. For this purpose, I have had made this small bistoury, the blade of which is about half an inch long, while its width is a little over one-third of a line. With this, in some cases, I incise each little swelling, cutting deeply to the bottom of the follicle. It is well to order patients to open all pustules and to gently press out the pus contained in them. When the treatment is indicated, I make the incisions I have spoken of, and allow each to bleed freely. I am convinced that by this treatment a cure is often much hastened. I am astonished that this procedure has not been fully appreciated, as in my hands it has proved very beneficial. It is especially necessary in acne of the back. Here a large surface is involved, the pustules being often very large. Opening as many as possible at each sitting, I induce a quite free hemorrhage. In cases of large pustules, I have further expedited the cure by applying a small dry cup to each one. The success I have gained in the treatment of pustular acne of the back has suggested to me the propriety of thus treating furuncles. On the face, it is well to apply hot water after the puncture of the pustules.

When acne exists on the patient's back, it is generally very

chronic and rebellious to treatment. In this region, lotions can hardly be used, therefore we are forced to employ ointments and baths. Such patients should lie in highly alkaline baths for fully an hour. I generally order two pounds of sal soda to be added to each bath. Their efficacy is further increased by adding from two to four ounces of the sulphuret of potassa to each one. The objection to this remedy is its horrid odor, resembling rotten eggs. Turkish and Russian baths are also beneficial, while sulphur baths are markedly so. The further treatment consists in the application of strong potash solutions or frictions with green soap, followed by the inunction of ointments. For this purpose I prefer the following, as being more cleanly and less objectionable than many :

<b>R</b>		
Lac sulphur . . . . .		3 iiij.
Pulv. camphor . . . . .		3 i.
Acid carbol. . . . .		gtt. xxx.
Cosmoline . . . . .		3 i.
Ung. simplicis . . . . .		3 i.
Mix.		

This must be rubbed well into the whole surface every night, preferably after a bath or friction with green soap. Then the case must be watched and each pustule thoroughly incised as soon as it appears.

Much can be done by preventive treatment in acne of the face besides that already mentioned. Thus, as new pustules appear, they may be painted with solutions containing equal parts of colorless tincture of iodine and spirits of camphor, or one or two drachms of carbolic acid mixed with an ounce of alcohol. Or again, a diluted liquor hydrargyri pernitritatis, 3 ss. to 3 i., or even stronger, may be used. In some cases of acne indurata, the last solution, in its purity, may be applied to the papules and pustules. The action of this remedy is often very striking. In other cases again, these swellings may be carefully touched with pure carbolic acid, or a mixture of muriatic

acid in alcohol, one to three or four, or oleate of mercury, ten per cent. Great care is necessary in making these applications, which should be done either by the physician or some intelligent person. In general, a small asbestos brush is the best means of application. Care must be exercised that none of the solution runs on healthy skin. To avoid this accident, it is well to have ready at hand small narrow strips of blotting paper. These applications, which are useful in the less hyperæmic forms of acne and in rosacea, must be used according to indications. It is well, after each application, to carefully sponge the face, and to smear it lightly with simple ointment or sweet oil. Perhaps, if there is much redness produced, one of the mild astringent lotions may be applied. The latest therapeutic agent in the treatment of acne is electricity. The rationale of its action is to promote absorption and to cause contraction of bloodvessels. It is especially, if at all, useful in cases of the acne which we have called hyperæmic. In several cases, I have seen marked benefit where other remedies had, for a time, failed. It is an agent, however, which will never, in my judgment, be used as the exclusive treatment in any case, as I have found that its action was greater in constricting the cutaneous capillaries than in promoting absorption of the glandular lesions. Even if only beneficial in this limited manner, it is a method worth trying, as in many cases, the red patches which complicate acne are of very great annoyance. When applying this agent to the face, I use an electrode, which, I believe, was first suggested by my friend, Dr. Satterlee. It has one handle, provided with two electrodes, which are small and flat and can be separated to varying distances. Using eight to ten cells of a Drescher battery, you apply the electrodes to the parts for ten or fifteen minutes. They become very red, but this state soon disappears. Applications of faradization may be made every day or two, and after

them one or other of the ointments or lotions may be rubbed in.

The treatment of comedones is often an important part in the cure of a case of acne. These swellings are simply sebaceous glands, much distended by desiccated sebum, owing to the closure of the opening, generally by dirt. The indication is to express the contents, which is much facilitated by the hot water affusions and soap frictions. Then placing the open end of a watch-key, or a little instrument devised for the purpose by my friend, Dr. Piffard, just over the apex of the tumor, you press firmly downwards, thus producing much compression on their circumference, and causing the contents slowly to escape in a worm-like coil. While in some instances you may cause the disappearance of the comedo, in many others you may fail, owing to the fact that the hypertrophied wall of the follicle remains, and it fills up. The indication then is very clear—namely, to destroy this follicle, if possible; at the same time, to produce no disfigurement. To this end, I pass well down into each follicle, after the extrusion of its contents, a very small needle of irido-platinum, attached to the negative pole of a Drescher battery, using about twelve cells. Then the patient takes in her or his hand a sponge electrode, and the circuit being established, the parts are decomposed by electrolysis, a slight whitish froth being seen around the needle. By patience you can destroy quite a number of comedones at one sitting, some patients being more restive than others. For a few days, you see a small red spot which soon fades, leaving a very minute white speck of cicatrical tissue. I can speak with much positiveness as to the efficiency of this method, and of the ultimate good results obtained. Another excellent mode of treatment is to deeply pierce each follicle with a fine platinum needle covered with nitrate of silver. For this purpose you have a small platinum crucible with a handle attached, and a needle of the same metal fixed in a firm handle. Having

melted a small quantity of nitrate of silver by heat in the crucible, you dip the needle into it and then plunge it into the follicle. The nitrate of silver cools on the needle in a thin coating and is carried by it into the tissues, where it dissolves. I cannot speak with equal confidence of the treatment of milium. The best mode of destroying them is to incise each one, scrape out its contents and apply a strong acid to the bottom of the little wound. This is a long, tedious process, and in my experience, patients rarely submit to more than one séance. I have likewise met with no success with the nitrate of silver punctures in milium.

Turning our attention now to the treatment of rosacea, we find that we have a different condition from any thus far spoken of. Until now we have studied the treatment of inflammation and cell increase around the sebaceous follicles, with a greater or less amount of hyperæmia connected with some cases. I have used, as you know, the term hyperæmic acne in a qualified sense, to bring distinctly to your minds those cases in which there is much hyperæmia existing as a complication of the sebaceous lesion, and you will distinctly understand the relation. In acne the lesion begins primarily in the glands, added to which we may have more or less hyperæmia as a complication. Clinically, we have simply papulo-pustular acne, or in short, acne. If, owing to various causes, the lesions are excessive from cell increase, we have the so-called acne indurata, and in those cases in which, together with papules, pustules and comedones, there is marked hyperæmia, we have what we have termed hyperæmic acne. This hyperæmia, however, in acne is peculiar. It is not, as a rule, followed by thickening of the skin, dilation of the capillaries and nodular growths. It runs its course as a hyperæmia, while the cell-change is around the glands. Now, in contradistinction to this condition, the affection which I call rosacea never begins in the sebaceous folli-

cles. It is at first a mild congestion of a limited portion of the face, usually of the nose. It may exist in a subacute form for a long time, during which there may be but little thickening of the skin. When it persists, however, you observe that a profound change takes place in the skin. It becomes thicker, more condensed, not easily pinched up, and upon the nose it seems to be bound down firmly to the bony and cartilaginous framework. Increasing still in severity, the superficial capillaries become visible, until finally many of them come to look like red lines running over the surface. If you study such a case, you will observe beyond doubt that the essential part of the morbid process is chronic hyperæmia, and that upon it all further changes depend. The result is that the whole skin itself becomes thickened, owing to the increase of its cell elements; further, the subcutaneous connective tissue becomes hypertrophied and condensed. In proportion as the cell increase is very great, so do we see nodules form which, in some cases, attain a large size and then cause much deformity.

Very often, as seems very natural, the sebaceous glands are secondarily involved. In some instances there is marked increase of their secretion giving the parts an oily appearance ; in others there may be a few papules or pustules but the sebaceous glandular element can always be seen to be a small point of the whole process. You will further appreciate this fact in the treatment of cases as the glandular complication rarely or never causes you much trouble, whereas, it is sometimes difficult to cure the rosacea. There is still another distinguishing feature, acne generally begins at puberty, rosacea is peculiar to middle life, usually appearing after the age of twenty-five. These remarks upon the nature of this affection will be useful first in giving you a general and clear idea of it, second in teaching you the pathological changes you are required to treat. In practice you will find as a rule, two classes of cases, first, those in which

there is simply hyperæmia, being examples of the earlier stages, and second, those in which there is the addition of cell increase, which are examples of the late stages. The treatment of each is similiar, and varies only in its activity and energy. Taking first a mild case of rosacea your object is first to cause a constricted state of bloodvessels chronically engorged. To this end you order the hot water and soap frictions, followed by the sulphur lotions, or, if there is much heat, that composed of calamine and bismuth. These should remain on all night. Very often the use during the day of, if practicable, zinc ointment and camphor act admirably. The object of the application being stimulation and astringent action, your success depends chiefly, on the careful adaptation of the amount of stimulation. No rule can be laid down as to the strength of the solution to be applied, in some cases moderate stimulation causes violent reaction, in others it is surprising to see how little effect strong applications have. Very many of the ointments which were recommended for acne are beneficial in rosacea. While it is well to keep up the hot affusions, soap frictions, and the applications at night, it is well from time to time, to use one or the other of the very strong solutions which I have named. That of carbolic acid and alcohol, those of bi-chloride of mercury of potash, and the solution of pernitrate of mercury. As the application of these requires much care, they should only be used by the physician or some one especially taught.

As to the frequency of application no rules can be laid down, some cases will bear daily stimulation, others less frequently. In rebellious cases I strongly advise very active stimulation, with either of the articles mentioned, even to the production of much heat and redness, which can readily be controlled by applying during a part or a whole day, the ordinary lead and opium wash or simple water dressing. This practice often produces excellent results for you use intense stimulation and

avoid inflammation by the cooling lotion. In cases of rosacea in which there is not very great cell increase, I can recommend with confidence the following ointment :

R

Liq ferri sub. sulphat.	3 ii.
Ung. simplicis	3 vi.
Cosmoline,	3 ii.

Mix.

A considerable thickness of it should be spread on lint, and then retained on the parts for several hours, and during the whole night if possible. Sometimes a slightly constringing sensation is induced, which can be remedied by soap friction followed by the inunction of a little zinc ointment. The latter compound mixed with subnitrate of bismuth, (3 ij to 3 i,) and camphor in the strength already given, is often an excellent application, especially in very hyperæmic cases and in females. Again for the milder form of cases I have come to place much confidence in the following paste :

R

Lac sulphur.	3 iij.
Bismuth subnit.,	3 ij.
Pulv. camph,	3 ss.
Potassæ sub. carb.,	gr. xx.
Glycerinæ,	3 iij.

Mix.

This may be painted on the parts with a camel's hair pencil. Some authors speak highly of hypo-chloride of sulphur, and a formula much used is as follows :

R

Sulphuris hypochloridi,	3 ss.
Potassæ sub-carb.,	gr. xv.
Ung. simplicis,	3 i.

Mix.

It would be but wearisome repetition if I were to further enumerate the various preparations for mild forms of rosacea, the cardinal point is, as I have said, stimulation and astringent action, and I have already given you numerous formulæ. I

might add that faradization will sometimes be of marked benefit.

Let us now consider the treatment of rosacea in its advanced stages. Here we are called upon to relieve hyperæmia, and cause absorption of new cells. The usual preparatory treatment by soap frictions is especially called for. It is well to use the soap itself in these cases, and having produced a copious lather to allow it to remain on the skin for an hour or two if possible, before the application of a lotion or ointment. The latter should be one or other of those already spoken of, made in full strength. Following the advice of Hebrä, I have used with good results a plaster made by spreading green soap on lint, which is to be retained on the parts for several hours. Very often increased redness and tenderness follow, which may be controlled by mild applications. A mercurial plaster may be applied to the parts every night after the usual treatment, and if it can be retained for several days so much the better. One of the disadvantages in the treatment of this affection, is, that your applications can only be used at certain times, so that it is for long periods under no treatment whatever. In some, indeed many instances, the thickening may be much relieved by using very strong potash solutions, ( $\frac{3}{4}$  ij to  $\frac{3}{4}$  i). This should be applied after hot affusions and followed by the cold water dressing or a mild ointment. A favorite plan of treatment with me is to paint the parts with acetum cantharidis made with glacial acetic acid. This should not be used by the patient, but applied once or twice a week in addition to other measures by the physician. I will say once for all, that it often is necessary to apply a water dressing or the lead and opium wash after excessively stimulating applications. You will find Vlemingkx's solution and Rochard's ointment much praised in the treatment of rosacea. They possess virtues as stimulating agents. Not to tire you with a further list of remedies, I

would ask you to remember the various mercurial preparations. Such of especial benefit are the solution of pernitrate of mercury and a quite strong bin-iodide of mercury ointment, and also one formed of iodide of sulphur. A paste of sulphur with sub-carbonate of potassa rather stronger than that recommended for the mild form of rosacea has in my hands yielded most satisfactory results, and the same may be said of an ointment containing three drachms of the solution of the sub sulphate of iron to the ounce of ointment. Such is a general outline of the remedies at your command in the treatment of this annoying affection. Though it is chronic in its course, and very persistent, and may sometimes tax your therapeutic resources, I am sure that you can relieve and even cure your cases, if you cause the treatment to be sedulously followed. A hap-hazard course will always tend to your discredit, therefore you must insist that your directions are fully and carefully carried out. A final word as to the treatment of the enlarged vessels. They require radical means. With a small thin bistoury you make a number of incisions transverse to the axis of the vessel, cutting well into the skin, allowing and even inducing free bleeding. After this procedure you may paint the parts with a very strong solution, such as of the perchloride of iron, pernitrate of mercury, or even pure carbolic acid, which as an occasional application should not be forgotten. In some severe cases I have used multiple deep punctures over the whole diseased surface with marked benefit. For the relief of the enlarged vessels, you may also use the galvano-cautery. Employing a small flat platinum wire you sear the skin along the course of the vessel, and it quickly withers.

Finally I will add that in all of these cases, both of acne and rosacea it is absolutely necessary to use the internal medication together with the local treatment.

## TWO LECTURES ON LISTER'S ANTISEPTIC METHOD OF TREATING SURGICAL INJURIES.

BY JAMES L. LITTLE, M.D.

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### LECTURE I.

**GENTLEMEN:**—We will turn our attention this morning to the subject of "Antiseptic Surgery," a topic, at present, of universal interest, and one with which, even should you never practice it, scientific medicine demands that you should be familiar.

Acknowledging its importance, then, we will at once pass to a consideration of the subject. Up to a comparatively recent date all the putrefactive changes taking place in organic substances were supposed to be produced by the oxygen of the atmosphere; the belief being based upon the fact that when the atmosphere was thoroughly excluded from the substance or substances in question, no putrefactive change occurred; and that such changes did take place soon after air was admitted, or when it was not excluded.

Microscopic examinations, however, soon determined the fact that other substances were present in the broken-down material, besides the products of decomposition. Minute living bodies, among which bacteria stand most prominent, were found to exist there in immense numbers. Whether the

substance was solid or fluid, these little bodies were found swarming through it, living and multiplying, and the results of the experiments of Pasteur, Sanderson, Lister, and others show that putrefaction is caused, not by the action of oxygen, but by the presence of these minute organisms, which by their rapid multiplication occasion a kind of fermentation which we call decomposition, or putrefaction. The next question which very naturally arose was, how and where do these organisms originate?

Bastian on the one hand, advocates the theory of spontaneous generation, while others, including Tyndall, show by various experiments that the germs must have already existed in, or been introduced into the fluid or solid before the bacteria and their kindred could be produced. To-day some of the greatest minds in Europe are engaged upon the subject; the scientific journals are filled with articles relating to it; and although the question is still unsettled, the practical application of some of the results of these researches and experiments has been successfully made in our department of medicine, viz., Surgery.

Professor Lister, accepting the germ theory, has applied to the treatment of open wounds an entirely new method, which has so far yielded the most wonderful results. To-day I wish to give you some details concerning it, and before doing so I should like to impress it thoroughly upon your minds, that in order to obtain results such as Lister's, it is absolutely necessary that nothing, however little, should be slurred over, and that the fullest and most careful attention should be paid to all details, both during and after the operation.

Accepting the "germ theory," then, we must believe that the atmosphere, everywhere about us, is filled with germs of various kinds, that, when the air is allowed free access to a wound, are liable to settle upon and cling to it, and the resulting

organisms to breed and multiply, almost *ad infinitum*, filling the fluids, pervading the solids, and producing changes that result in putrefaction. Knowing this then, it is very easy to understand that when the air containing such germs is thoroughly excluded from a wound, or when these germs are destroyed before reaching it, no such changes will take place. That degree of inflammation and suppuration which has hitherto been considered essential to the healing of wounds, will be entirely prevented. Absorption of the products of decomposition not taking place, traumatic fever will not show itself, nor indeed will there be any rise in temperature.

Let us turn our attention for a few moments to the manner in which wounds heal.

There are two principal methods by which healing takes place. First, that which is called healing by adhesive inflammation. In these cases slight redness takes place around the wound; plastic lymph is poured out between the cut surfaces; there is a slight rise in temperature, and a small cicatrix is left after the wound is healed. This method surgeons generally call healing by "first intention." Second, healing by granulation or "second intention." This takes place in those cases where, either from the edges being kept apart, or from some loss of tissue, primary union cannot take place. What results? Inflammation is set up around the wound, there is redness more or less marked, and a rise in temperature,—the so-called inflammatory or traumatic fever. The wound soon becomes covered with a thin pellicle of exudation, which rapidly goes on to the formation of pus. The pus once formed, the redness diminishes or disappears, the pain subsides, the temperature falls, and the discharge continues until the granulations rise up to a level with the edges of the wound, and cicatrization takes place.

I have purposely left out some of the methods of healing:

the two that I have given you sufficing to illustrate what I have to say.

An open wound, treated strictly in accordance with the rules laid down by Mr. Lister, will heal without the appearance of any of the above described phenomena characteristic of union by the second intention, and under this treatment we no longer look for the "healthy, cream colored, laudable pus" of olden times. Indeed, that which we once considered normal, we now consider abnormal. I have performed a number of successful operations by this method. Recently I amputated the thigh of an old woman on account of malignant disease of the lower extremity. After the amputation the patient's temperature was accurately taken morning and night, and never, at any time during convalescence, did it rise higher than 99°, nor was there the slightest suppuration. The same result followed recently, in an amputation at the knee joint. I have also had, lately, five successive cases of removal of the breast heal without the slightest redness around the wound, the formation of pus, or elevation of temperature. To be sure, breasts dressed in the old way would occasionally heal without suppuration, but, gentlemen, this was a rare occurrence in my experience,—partial union being the rule, with more or less suppuration. Lacerated wounds, compound fractures, have all done well under this treatment.

You will remember that you have been taught that in the healing of wounds a certain amount of inflammation is necessary. This has sometimes been called healthy inflammation. The most severe lacerated and contused wounds clean off, granulate and heal under Mr. Lister's method of treatment, without pain, redness, heat, swelling or constitutional disturbance. In short, gentlemen, without inflammation. Traumatic inflammation must always be considered, an abnormal or pathological condition which can by proper treatment be prevented. Re-

pair can take place without it. I think, gentlemen, that if these successes continue, some of us will be obliged to re-study our surgical pathology.

With these preliminary remarks, I will now describe in detail the materials used in applying Lister's method. Of all substances used as germ destroyers, carbolic acid has, thus far, proved to be the most effectual. Other antiseptics have been tried, but the results do not equal those obtained with carbolic acid.

Recently thymol, a substance derived from the oil of thyme, was brought forward as an antiseptic to take the place of carbolic acid. It was tried in the New York and Roosevelt Hospitals, but was soon found to be inferior in its antiseptic qualities to the carbolic acid. Dr. Weir states in a paper on the subject that in twenty-five cases in which it was used there were fourteen cases in which an aseptic condition was not preserved. It is to be hoped that some more pleasant antiseptic will soon be discovered to take the place of the disagreeable carbolic acid.

The principle of Lister's method is essentially this : In treating an open wound, let neither the air, the instruments you use, your hands, nor the dressings that are to be applied, nor in fact anything, come in contact with the wound unless it has been thoroughly saturated or wet with a solution of carbolic acid, and, at the same time, keep the wound thoroughly drained.

Carbolic acid comes in crystals, but the addition of a little water dissolves them, and gives you a solution. This sample, which I show you, is known as Calvert & Co's crystals of carbolic acid No. 1. When here in 1876, Mr. Lister said that he used the absolute phenol, which he thought had less odor, and was more soluble than carbolic acid, which, however, is less expensive, and answers equally well. You should procure two bottles ; one that will hold a quart, and one that will hold two

quarts ; and a two ounce graduate. The quart bottle of course contains thirty-two ounces, and by pouring out two ounces of water, you have thirty left. To this quantity of water you add an ounce and half of carbolic acid, and you have a solution of the strength of 1 part of carbolic acid to 20 of water. By filling the two quart bottle with water, pouring off four ounces, and adding the same amount of carbolic acid ( $\frac{2}{3}$  iss.) you have a solution of the strength of 1 part of carbolic acid to 40 of water. If, however, you wish to keep but one solution on hand, let it be the 1 to 20, and by pouring a cupful of this into a basin and adding a cupful of clear water, you have the 1 to 40 solution, whenever you may wish to use it. I think it is better to keep both on hand. Now, you are ready for work, in so far as the solutions are concerned.

The proper use of the 1 to 20 and 1 to 40 solutions is a matter of importance, and it may be well to dwell a little upon it. The 1 to 20 solution is used for purifying the parts upon which you are about to operate. They must be thoroughly washed off with soap and water, and afterwards cleansed with the solution. The hands of the surgeon and his assistants should be thoroughly cleansed, the finger nails being well cleaned by the use of a nail brush, and afterwards the hands should be dipped in the solution. The instruments and sponges to be used should be placed, if possible, in this fluid, about half an hour before the operation. Again, the 1 to 20 solution should be used in compound fractures and recent wounds, in order that any germs that may have found lodgment in them may be destroyed.

This 1 to 20 solution is too strong to use for any length of time, as it benumbs your hands so that it is very difficult to operate, and is, therefore, only used at the beginning of the operation to purify the surgeons hands and the parts to be operated on ; the 1 to 40 solution then being substituted and continued, it being strong enough to keep the parts in an aseptic condition. The

1 to 40 solution is also used for the instruments and sponges during the operation.

I dwell on this point, as there is some difference of opinion as to the use of these two solutions. In order to settle this, I wrote to Mr. Lister and received the following reply :

12 PARK CRESENT, PORTLAND PLACE, 11th Dec., 1877.

MY DEAR SIR :—In reply to your inquiry in your letter of Nov. 26th, received yesterday, I write to say that I use the 1 to 20 carbolic acid lotion for purifying the skin of a part about to be operated on, and also my own hands before I begin to operate, and for cleansing instruments and sponges, and also for the spray, when a steam spray producer is employed. The 1 to 40 lotion is our ordinary lotion used for the sponges during the course of an operation, (the sponges having been purified before the commencement of the operation with 1 to 20) and for washing the wound when requisite, and for the lotion in changing dressings. The 1 to 20, I should add, is used for washing (in order to purify them) wounds inflicted accidentally, such as compound fractures.

Thanking you for your kind report of the progress which antiseptic surgery is making in America.

I remain, yours very truly,

JOSEPH LISTER.

A very important feature of this method, is the use of the spray. This is used for the purpose of destroying the septic germs in the air before they reach the wound. So we have to perform our operations and apply our dressings in a cloud of spray formed from a 1 to 20 solution of the acid. The apparatus we generally use is a steam atomizer.

A good spray producer should break up the fluid into a fine cloud, the finer the better, as coarse spray soon wets the operator's clothing and condenses rapidly upon the bed, and the hands and clothes of the surgeon. The apparatus should be large enough to work for from one and a half to two hours at a time. It should be so arranged that it can be placed and maintained at any level that may be desired, and should

also have a contrivance by which you can regulate the amount of heat by raising or lowering the flame.

All the spray producers which I here exhibit to you, have one fault—the flame not being protected by a piece of wire gauze, to make the light perfectly safe when using in proximity to ether; for in using these unprotected flames some serious accident will yet occur. Only a few days ago, while operating under the spray, the flame of the lamp being a little below the level of the patient's head, the ether caught fire, and an explosion resulted which might have proved very serious. Fortunately, the patient was but slightly burned. Some of the lamps used are a little better protected than others, but they should all be surrounded with wire gauze after the manner of Sir Humphrey Davy's lamp, and thus made absolutely safe.

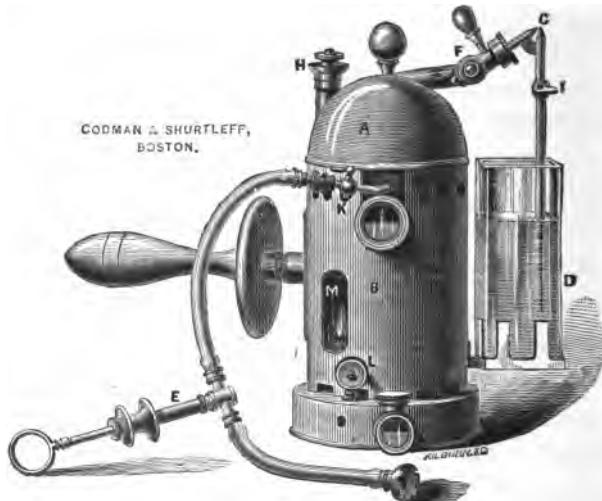


FIG. 1.\*

The best spray apparatus is, undoubtedly, that made by Codman & Shurtleff, of Boston, Fig. 1. By means of a window in the boiler, you are enabled to determine when the water is get-

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\* The pump E is no longer used for the purpose of filling the boiler.

ting low, and by a similar arrangement in the lamp, the amount of alcohol present. It has an apparatus by which the flame is raised and lowered, so that you are able to regulate the force with which your spray is projected. The one which I here show you has a very fine tube, which produces a very minute breaking up of the fluid, giving us a light cloud of spray. The spray-tube is also provided with a cleaner, an ingenious arrangement by which, if the tube becomes stopped, it can be instantly cleaned out. It also has a stand, which makes it very convenient for hospital or clinic work, being so arranged that you can raise or lower it as you wish.

The next best instrument for this purpose is the one devised by Dr. Weir, Fig. 3, which has the advantage of being cheaper than the one of which I have just spoken. For hospital work it answers very well. It gives a good spray. It has a jointed spray-tube, so that the spray can be directed at any angle.

\* Since this lecture was delivered Messrs. Codman & Shurtleff have made a spray apparatus, which is represented in Fig. 2. The flame is completely protected so that ether dropped from a sponge, on the outside of the gauze will not ignite. The apparatus is also less expensive than the larger one (Fig. 1.) The fixed spray-tube requires that the apparatus be held by a competent assistant, so that the spray can be constantly directed on the wound.



FIG. 2.

The lamp-flame, however, should be thoroughly protected with wire-gauze.

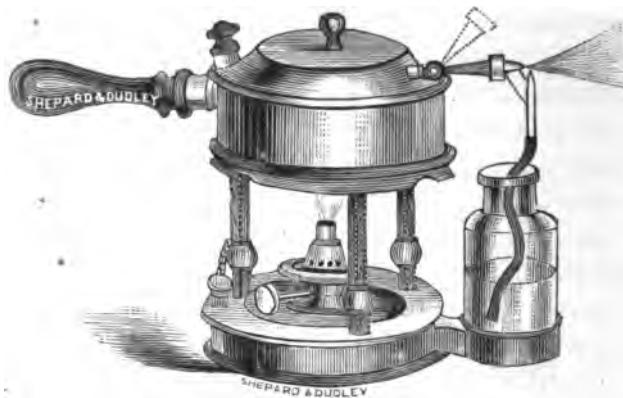


FIG. 3.

I have here a small instrument that has done me a great deal of service, Fig. 4. This is a Tiemann's Steam Inhaler, altered, at my suggestion, by Schmidt, so as to give a good spray. It answers very well for dressing wounds. It can also be used for large operations; but I think it is better to use a larger spray apparatus, this smaller one answering well for subsequent



FIG. 4.

dressings. Mr. Lister uses a still smaller one for this purpose, which he carries in his pocket. This little one which I have, will work for over an hour. The best instrument is the one which makes the finest spray, it wetting and numbing the hands but little, and causing the fluid to last longer, while producing as good an effect upon the tissues. The spray-tube, in order to accomplish this, should be of small calibre. Always be careful to see that the safety valve is right before you use it, and let me once more caution you against bringing the unprotected flame too near the head of the patient when ether is being used as anæsthetic. In case a steam atomizer is not at hand, a good spray can be secured by the use of Richardson's spray producer, (Fig. 5). This is a very convenient apparatus to use in small operations, and also in dressing wounds after operations.

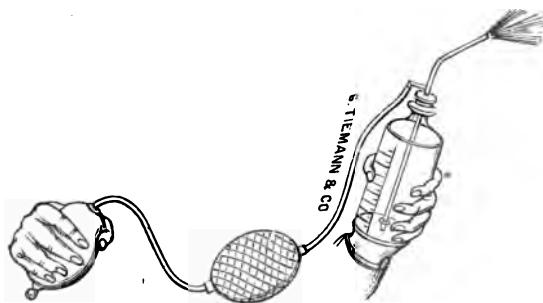


FIG. 5.

If at any time during an operation the spray should be arrested or require to be temporarily interrupted, the surgeon should protect the wound by covering it with a piece of gauze soaked in a 1 to 20 or 1 to 40 solution of carbolic acid. In the operating-room of St. Luke's Hospital we have, as many of you have seen, a powerful atomizer for use during surgical operations. For this apparatus the steam is supplied by a flexible tube, from the steam pipes which pass under the floor of the operating-room, and the pressure is so great that a most powerful spray is pro-

duced. This is probably the best spray producer for hospital use that has ever been invented, giving an immense volume of spray. It has already been introduced into several of our large hospitals. The figure before you (Fig. 6) represents the mechanism of the apparatus.

The accompanying drawing represents a sectional view of this improved steam-atomizer. The figure is one-half the actual size, and *M*, the filter or strainer is double the actual size. The apparatus consists of a steam-supply tube and superheating vessel with an atomizing tube, the steam-supply tube being surrounded by a gas-tube that is opened below the superheating vessel for heating the same. A chimney incloses the superheater and brings the flame in contact with the entire surface of the same. The superheating vessel is supplied with a filter or strainer that prevents any impurity from entering the atomizing-tube, which in this way is guarded against being stopped up. Between the atomizing tube and the superheating-vessel is a cock for draining the apparatus of condensed steam before using.

The superheating of the steam forms the essential feature of this apparatus, as thereby any interruption in the continuity of the spray by the spouting of the atomizing-tube, owing to the condensed steam, is completely avoided, and a uniform, powerful and continuous spray obtained.

Referring to the drawing, *A* represents the steam-supply pipe, which is connected by a flexible-tube *B* to any suitable steam-generator.

The steam-pipe *A* is provided at the upper end with a superheating-vessel *C* of spherical shape, that is rigidly secured to the steam-pipe.

The atomizing-tube *D* extends from the superheater *C* at right angles to the steam-pipe *A*, and terminates in the customary manner above a spray-tube *D'*, that is connected with the vessel *E* containing the antiseptic fluid. *M* is the filter or strainer, the meshes of which are exactly one-half the size of the orifice of the atomizing-tube *D'*.

*KL* shows the drainage cock which can also be used to turn off the steam completely.

The steam-pipe *A* is surrounded by an exterior tube *A'*, that is connected at the lower part by a short branch pipe and flexible tube *H*, with the gas-bracket, to supply gas, when the cock is turned on, to the space formed between the steam-pipe *A* and exterior tube *A'*.

The upper end of the exterior gas-tube *A'* is split, and curved outwardly below the superheater *C*, so that by lighting the gas a sufficient quantity of air may be supplied to the same. The steam in the vessel *C* is superheated by the gas flame, and thereby forced in a perfectly dry state, under considerable pressure, through the orifice of the atomizing-tube.

A cylindrical chimney *C'*, is attached to an arm, *G*, of the outer gas-tube *A'*, the chimney encasing the superheating-vessel, and being contracted at

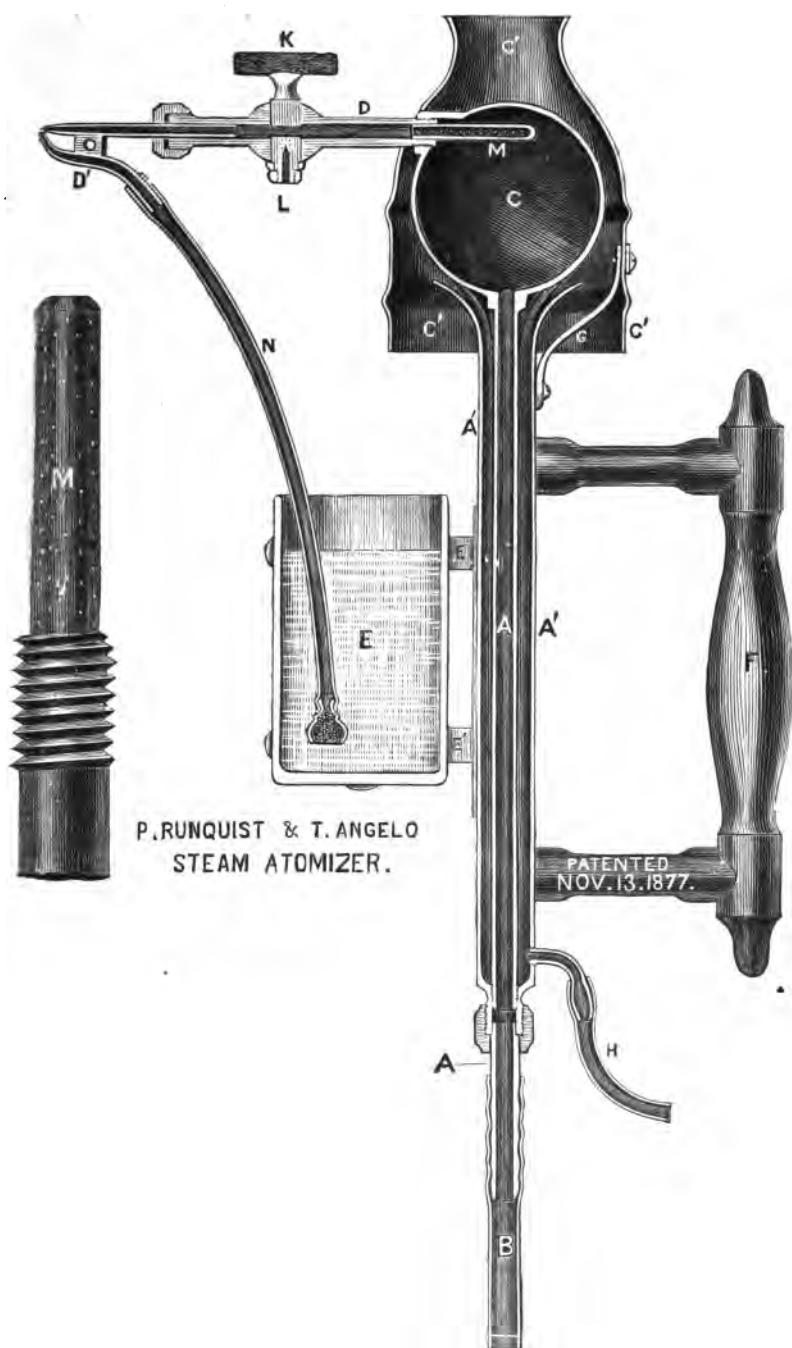


FIG. 6.

the upper end. This chimney keeps up a sufficient air-supply to the flame, and serves mainly for the purpose of lapping the flame from the superheating-vessel so that the heat acts evenly on every part of the spherical vessel and changes the steam into superheated steam of high pressure. To the outer gas-tube is attached a handle, *F*, by which the atomizer is held by the assistant, and the spray directed to the parts operated upon, as required.

The vessel or cup *E*, containing the medicinal liquid, is supported on spring-clamps *E'*, that are applied to the outer gas-tube *A'* by an encircling spring-tube or spring bands, so that the spring-clamps may be readily adjusted higher or lower on the outer tube, as required.

The lower spring-clamp *E'* has inwardly bent lugs or seats, on which the vessel is supported when placed in position between the clamps.

We will now turn our attention to the "antiseptic gauze." This is made of very coarse muslin, or cotton gauze, a material which is known as "cheese cloth." This is folded so as to fit in a double-walled tin vessel, and heated by steam or boiling water. It is then sprinkled with its own weight of a hot mixture of five parts of resin, seven parts of paraffine and one part of crystallized carbolic acid. The resin and paraffine are to be melted together in a water bath, and the carbolic acid slowly and carefully stirred in. This can be sprinkled over the outer layer of the gauze with a large syringe. It is then to remain for twenty-four hours under a heavy weight, a sheet of lead will answer, in the hot tin vessel, so that the whole mass of gauze will be equally penetrated throughout with the mixture. In our hospitals where large quantities of the gauze is used, it is prepared in the following manner, as suggested by Dr. Weir: One thickness of the gauze passes from a roller into a box containing the hot mixture which is kept hot by a steam coil in the bottom of the box. The gauze being guided through the mixture becomes soaked with it, and is then passed out of the box and with five or six layers of dry, warm gauze, tightly rolled upon a roller. The extra amount of the mixture on the wet layer is sufficient to impregnate and thoroughly carbolize the dry layers rolled with it. By this process about three hundred yards can be prepared in an hour.

As it is a difficult matter to make this material, it would be as well for you to purchase the gauze from some of our instrument makers. It costs from ten to fifteen cents a yard. It should not cost so much as it is made in our hospitals at an expense of about six cents a yard. Free use of the dressing being necessary, the cost is something to be considered.

It should be kept rolled up in a thick piece of brown paper or in a tightly-covered tin vessel. The resin and paraffine are used for the purpose of holding the acid firmly fixed in the meshes of the cloth and preventing its evaporation, which would certainly occur without them. This prepared gauze is used for covering wounds and making bandages for dressings.

In cutting the gauze for bandages it is a good plan to pull out one of two threads the length of the material, so as to serve as a guide, otherwise it is very difficult to cut this flimsy stuff straight enough to make good roller bandages.

Another material used is the Mackintosh cloth. It is an imported article and consists of cloth on one side and rubber on the other. It has a strong odor of carbolic acid, and is used to protect the parts from the atmosphere. Before using it, hold it up to the light and determine whether or not it contains any holes, for even a small pin-hole through it is liable to cause an unpleasant failure of the whole plan. A piece of rubber cloth, or rubber tissue, in fact anything of the kind will answer equally well. This, however, is supplied a little cheaper than the rubber tissue, and is, on that account, generally used.

There is another article used, known as the "protective oiled silk." This is, as imported, a fine green oiled silk, prepared by having both sides coated with a thin layer of copal varnish, and then thinly coated over with a mixture consisting of one part dextrine, two parts starch, and sixteen parts of the 1 to 20 solution of carbolic acid. This is allowed to dry on the oiled silk. What is it for? It is called protective oiled silk and is used to protect the wound from the action of the carbolic acid,

for while this acid is all powerful in destroying germs, it will, if left in contact with the parts too long, prevent union or healing. Carbolic acid is only meant to come in direct contact with the surface during an operation or while dressing it afterwards. A small piece of this silk laid over the wound protects it from the action of the acid in the gauze, which is laid above it. It should be dipped in the 1 to 40 solution before using, so as to destroy any germs of putrefaction which may have lodged upon it. The reason that dextrine, &c., are used is to enable it to become uniformly moistened when dipped in a watery solution.

In addition to the Mackintosh cloth and oiled silk, we must have some other appliances. Foremost among these in Mr. Lister's treatment, is black rubber tubing. It is kept in open wounds for the purpose of drainage.

There are various sizes of this tubing, and it is used in this way: A piece of the tubing with a number of holes cut in its side, Fig. 7 is placed in the wound with one end just pro-



FIG. 7.

truding from between the lips. To keep the tube from slipping either in or out it is a good plan to pass a thread and needle, previously carbolized, through the tube and the skin, thus stitching it in for the first few days. This can be easily done while the patient is still under the influence of the anæsthetic, or a better way is to pass a carbolized thread through the end of the tube and fasten the thread to the patient's body, at some distance from the wound, by a piece of adhesive plaster. Unless you resort to some such expedient you will have trouble in keeping the tube in place.

Volkmann, a German surgeon, thrusts a fine cambric needle

through the end of the tubing, which prevents the tube from slipping in.

These tubes, as I have already told you, are for the purpose of maintaining free drainage of the wound. If there is much discharge the parts should be daily cleansed with the 1 to 40 solution. If, however, the wound is doing nicely there is no need of this, it being simply necessary to cut off the tubing, piece by piece, as it is pushed from the wound by granulations until the last portion is reached, when you will remove it.

If on the second or third day there is no discharge from the tubes, you can remove them. The lack of discharge at this time, indicates the union of the deeper parts of the wound. These tubes should be soaked in the carbolic solution (1 to 20) at least one hour before using. Carbolized catgut is useful for drainage, several pieces of the larger size being passed through in the same manner as the rubber drainage tubes.

For small openings I prefer the catgut to the drainage tubes. They need not be removed, as they melt away in the same manner as when used for the arrest of hemorrhage. In a case at St. Luke's Hospital, where the wound opened into the synovial cavity of the knee-joint I used the catgut, and as there were no indications for dressing, I did not uncover the wound for fifteen days. When I did so, I found the projecting ends of the catgut lying loose on the integument, and the wound filled with granulations. In this case I should not have felt so safe had I used the rubber tubing. Mr. Lister has recently been using bundles of carbolized horsehair for this purpose, removing a few hairs at a time as the wound heals.

Another thing very necessary to the accomplishment of a perfect result, is to be able to do away with irritating foreign bodies in a wound; for if there is any foreign body in the wound, and a silk ligature is unquestionable such, it will excite inflammation generally, and produce irritation always. Therefore in all

wounds where we try to get union by the first intention, we do away, as much as possible, with silk ligatures. Acupressure was the first step in this direction, torsion the second, and last and best of all, the catgut ligature. The carbolized catgut ligature is made by allowing the catgut to lie for two months or longer in an emulsion, made of one part of crystallized carabolic acid dissolved in 10 per cent., or one-tenth its weight in water, to which solution is added five parts of olive oil. This mixture on standing, separates in two parts. The oil and acid floating on the water. Small beads or pebbles are placed in the bottom of the vessel, and on these a piece of glass plate. The catgut rests on the glass, and is thus prevented from sinking in the watery solution at the bottom. It is best, I think, to buy them already prepared, and save yourself this trouble. They come in two or three different sizes. I find it difficult to get good catgut ligatures. You should always try them before purchasing. Those made by J. F. Macfarlane & Co., Edinburgh, I have found to be the best. They will keep good for years, if kept in the preparing fluid. Their great advantage lies in the fact that after you tie them you can cut both ends off short and leave the knot in the wound, for the animal substance soon dissolves, seldom producing any irritation. In cases where you do not care to apply antiseptic measures, the plain catgut ligature behaves in the same manner.

In the operation for simultaneous ligation of the common carotid and sub-clavian arteries, which I performed about a year and a half ago, for aneurism of the first part of the sub-clavian, I tied both vessels with this material. This procedure was very strongly objected to by some of the surgeons who were present. I tied them both very carefully, and was particular to tie the square and not the surgeon's knot. I then cut off both ends and left the knots in the wound. They caused no trouble whatever, and were never heard of again. The

patient, as many of you know is still alive, and the aneurism seems cured. I have never had a case of secondary haemorrhage following the use of this material.

Sometimes it is necessary to use silk for sutures. It should be passed through a compound consisting of one part of carbolic acid to ten parts of melted wax, and dried with a towel, by which means any superfluous material is removed. For sutures it is much better than catgut, as the latter soon melts and allows the wound to gap. Silver wire can also be used. A single suture containing one germ of putrefaction might cause a failure of the antiseptic dressing and result in the death of the patient. Gentlemen, this method of treatment calls for the most scrupulous attention to minute details.

Mr. Lister also uses the "safety pins," Fig. 8, which are



FIG. 8.

so made that their ends will not penetrate the Mackintosh cloth by the movements of the patient, and thus allow germs to reach the wound. This shows how carefully he acts upon the idea that the air is deadly poison to the wound, and that it must, consequently, be thoroughly excluded from the parts. So strongly is he impressed with this idea, that he says "a single pin-hole made in the Mackintosh cloth, might destroy the patient's life."

So much, then, gentlemen, for the materials used in applying Mr. Lister's method to the treatment of open wounds.

At the next lecture I will describe in detail the manner in which these materials are used.

## LECTURE II.

GENTLEMEN :—In order to successfully practice Mr. Lister's Antiseptic Method, it is necessary that we should believe, or act as if we believed, the atmosphere to be loaded with germs that are poisonous to open wounds, and, moreover, that the vitality of such germs may be destroyed by a proper use of antiseptics. By keeping these facts in mind, and endeavoring to follow Lister's directions to the letter, we will accomplish results hitherto unparalleled in the annals of surgery.

I am, as you can see, a firm believer in Mr. Lister's method of treatment, and was so persuaded by seeing results from it that I had never seen before. For the last twelve years Mr. Lister has been working out his plans to perfection. The first attempt that he made was to use carbolic acid in the opening of abscesses. This operation he performed under cover of a piece of lint saturated with strongly carbolized oil, and allowed the pus to drain off under this dressing. In this way the air was disinfected before coming in contact with the wound.

After this he began to use the spray, then dressings on tinfoil, and finally reached the point that seems to be as near perfection as possible, that is, his present method. Mr. Lister was recently called to fill the chair of Surgery in London in place of Sir William Fergusson, who lately died. At the time when he came to London there were but few surgeons who either believed or practised his method, and as a consequence, his first operation in this way, was attended by many men eminent in the profession, who were anxious to witness, and ready to condemn it. A patient with simple fracture of the patella was brought into the amphitheatre, and etherized. Prof. Lister laid open the joint, cleaned out the blood clots, wired the bony fragments together, made an opening for the drainage tube, inserted it, and closed the wound. All these procedures were of course carried out after his method. The patient fully

recovered, without inflammation of the joint, the temperature not having at any time gone above 99°.

As you well know, an opening into the knee-joint, was, up to a very late date, an exceedingly dangerous matter. Even a small penknife puncture in this situation has often brought about a fatal result, and we had come to consider such openings as serious as wounds of the abdomen. Nevertheless, in this case, Prof. Lister not only cut down and exposed the parts, but having wired the fragments, left a drainage tube in the joint and the patient recovered with no rise in temperature and an excellent joint. Gentlemen, such results are simply unparalleled.

I wish for a few moments to call your attention to all the materials used in performing an operation according to Prof. Lister's method. We must have

1. A spray producer.
2. A solution of carbolic acid, 1 to 20
3. A solution of carbolic acid, 1 to 40
4. Antiseptic gauze.
5. A piece of Mackintosh cloth or rubber tissue.
6. Protective oiled silk.
7. Rubber drainage tubes. If you fail to have these, soft catheters will do. If you have neither, a few shreds of carbolized horsehair or catgut will answer the purpose.
8. Bandages made of antiseptic gauze.
9. Catgut ligatures.
10. Carbolized waxed ligatures.

These are the paraphernalia necessary to perform an operation after the Lister method. In addition, all surgical instruments commonly used in operations are also employed. Looking over the list of these additions you may think that they must of a surety interfere with the rapid and proper performance of the operation. This, however, is not the case after you are once thoroughly familiar with their uses, the operation becoming as simple and as easy as when performed without them.

The following is the method carried out by Mr. Lister in performing any important operation. First, have on hand all the articles that I have named, being especially sure that your spray apparatus is in good working order. It is better to have two, in case one gives out. You next send your assistant to the house, before the operation, have the table prepared, and the sponges, drainage tubes and instruments placed in the 1 to 20 carbolic acid solution. You should, if possible, some hours before the operation, have the part to be operated upon thoroughly washed with soap and water, and afterwards covered with a cloth wet with a 1 to 20 solution of carbolic acid. If this is not done previous to the operation, you should be sure and wash the part with a strong solution, 1 to 20, before you begin. The patient being anaesthetised, yourself and your assistants prepare for the operation. The hands should be first washed with soap and water, taking care to cleanse the nails thoroughly with a brush, and then dipped in the 1 to 20 solution.

Now your 1 to 40 solution comes into play; one or two basins of it should be on hand. Into this your sponges and instruments are to be dipped during the operation. For the instruments, soup plates or the old-fashioned delf pie-plates will be found very convenient.

When the operator is ready, the spray should be started. The apparatus should be in the hands of a careful assistant whose duty it is to keep the cloud of spray constantly falling on the wound, never for a moment directing it elsewhere. As the surgeon changes his position, so should the assistant, so that he may not be interfered with. If the operation is to last long, some support will be needed for the spray producer; if not, it is best for the assistant to hold it himself.

During the operation, the instruments that have been used should be carefully wiped and replaced in the carbolic acid solution. Some of you may think that all these precautions

are quite unnecessary, but let me tell you, gentlemen, that it is only by carrying out fully and carefully these details that the best results are obtained. These spray producers are very unpleasant to use, for they throw the spray in all directions ; it gets in your face and mouth and benumbs your hands. Still this does not justify us in dispensing with it altogether, as some surgeons have done. Moreover, the surgeons who have neglected to use it have failed to get such results as I have described to you ; results that are quite easy of attainment, if Mr. Lister's most excellent rules are followed out in detail.

During the operation, some cat-gut ligatures may be needed ; a few should be taken from the bottle where they are kept and placed in the carbolic solution (1 to 20) and left there until wanted. They should be about a foot in length. When needed, ~~be~~ should be handed to the gentleman who is to tie the artery. ~~He~~ should tie it with a square knot, snip off both ends of the ligature and let the knot remain in the wound.

Another thing—during the operation, the solution in which your sponges have been cleansed will soon become very turbid. It is not necessary to throw this out and add fresh fluid, for a thorough squeezing out of the sponges is all that is necessary before you use them again. It is "*surgically pure*," says Mr. Lister, "as long as it contains a sufficient quantity of carbolic acid." It is a good plan to have the sponges passed through two or three basins of the carbolic solution before being again used.

I have found soft, dry towels to be excellent in cleansing bleeding surfaces, by crowding them into the wound and holding them there for a few moments. I have had these towels carbolized by soaking them in a 1 to 20 solution of carbolic acid and drying them in a hot air chamber. They must be prepared only a short time before the operation, as the carbolic acid evaporates from them rapidly.

The operation being completed, one or more drainage tubes should be inserted, if necessary, and the parts brought together either with catgut, carbolized silk or silver wire sutures. The former should never be used if there be much tension, for they are apt to melt away in a short time. If there is much oozing after the operation, a carbolized sponge should be placed in or over the wound as a compress, and left there until the next day. The rest of the dressings I will describe in a few moments.

Let me call your attention now, gentlemen, to the manner in which a wound should be treated when it has been exposed for a longer or shorter period to the atmosphere, and the germs it contains. Suppose you have a compound fracture. Air has certainly found access to the tissues, and with implicit faith in the germ theory, we at once proceed to disinfect the parts, or, in other words, to put them in an aseptic condition.

The usual result of such an injury is a strong argument in favor of Mr. Lister's method. You have been taught that if a person suffers from a fracture of any bone, be it single or comminuted, if there is no external opening, nothing need be feared so far as suppuration is concerned. Though the swelling be great, it will soon go down, the exudation be absorbed, and union of the fragments and the healing of the lacerated tissues take place without the formation of pus. But if, with the fracture, you also have an external wound, that is, a compound fracture, the prognosis is very different. Unless you succeed, by immediately closing the wound, in converting it into a simple fracture, free suppuration will take place and the pus may burrow about in every direction; erysipelas or pyæmia may result and death end the story. All this simply because air was admitted to the lacerated tissues.

The difference in the prognosis of a simple or a compound fracture, as I have already said, is great; the former good, the

latter very grave indeed. If, therefore, we can by any treatment whatsoever, give to the compound fracture the same prognosis as to the simple, we are undoubtedly doing a great work. This is the exact thing Mr. Lister aims to accomplish, and succeeds in doing with his method of treatment.

To do this, the wound should be first thoroughly washed out with the 1 to 20 solution of carbolic acid. A common Davidson's syringe will answer all practical purposes, and if unable to reach every part with any of its nozzles, a flexible catheter, previously thoroughly steeped in carbolic acid solution, may be passed in, and the wound carefully and fully injected, so that all parts are washed with the solution. In this manner the wound can be put in an aseptic condition. All this, if possible, should be done under the spray, so that while the dressings are being applied, no germs may enter.

It is in just this way, gentlemen, that the most surprising results have been produced. For the past ten years, probably, certainly for the past eight, we have been applying this principle in our hospitals to the treatment of such injuries, only it has been done less thoroughly than at present. The wound was washed out with a carbolic acid solution, not always thoroughly, however, and then protected from the atmosphere with some simple dressing, such as lint soaked in carbolized oil (1 to 10.)

Wounds of all kinds which have been exposed to the air are brought into an aseptic condition by washing them thoroughly with the 1 to 20 solution.

Now, gentlemen, I will describe the manner of applying the dressings after an operation, antiseptically performed, or after a compound fracture or any wound which has been brought into an aseptic condition by washing out with the 1 to 20 solution. You should always do your dressings under the spray. This is very important. After the wound has been

brought together and the haemorrhage checked, and, if necessary, a drainage tube inserted, you must take a piece of protective oiled silk, previously immersed in the 1 to 40 solution, and simply lay it over the wound. It should be just large enough to cover the wound; over this should be laid two or three thicknesses of the prepared gauze, thoroughly saturated with the 1 to 40 solution. This is to destroy any germs that may have lodged upon the surface of the subsequent dressings. The part is now covered with from six to eight layers of the gauze, previously prepared with a piece of the Mackintosh cloth, an inch less in diameter all around, placed underneath the upper layer. (Fig. 9.) The smooth surface of the Mackintosh cloth should

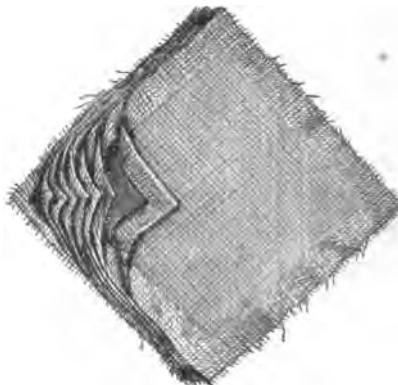


FIG. 9.

be turned towards the wound. These should be retained in position by a roller bandage made of the same antiseptic gauze. The eight layers of gauze, together with the Mackintosh cloth, should be large enough to extend a good distance beyond the wound in all directions. For instance, as I show you on this mannikin, if the wound to be dressed is just below the elbow, the dressing should be long enough to extend some distance above the elbow joint, and below, covering in the hand, and sufficiently wide to envelope the limb. The last dressing can

be secured with the "safety pins," taking care that they do not pierce the Mackintosh cloth.

The reason we use so much gauze is for the purpose of absorbing the watery discharge, so that we need not dress the wound often; not oftener than once in three, four or five days; the rule being to keep the dressing on until the discharge finds its way to the outside. As soon as this occurs, the dressing should be changed. In our hospitals, the moment this takes place, even if at night, the house surgeon is called up to redress it. Sometimes the number of dressings is so few that the surgeon's task is comparatively light.

During the first twenty-four hours, there is usually a very free discharge of serum from the surface of the wound: so great, indeed, that it may even in this time saturate all the dressings. This being the case, it is, of course, necessary to again dress it. As I have already said, if the wound is large, it is best to put on a very thick dressing. *You should not disturb a dressing unless there is pain, an oozing through at some point, or a rise in temperature.*

The fact that there are cavities in the wound in some cases, which will fill with serum, shows how necessary a drainage tube is. The use of the drainage tube may, however, be carried to excess. In several amputations of the breast, I simply brought the cut surfaces accurately together by means of pin sutures and applied well-adjusted compresses of antiseptic gauze, and over all the regular Lister dressing. They healed very nicely. When you can, by well-adjusted compresses, obliterate all cavities, there is no need of a drainage tube. If this cannot be done, by all means use a drainage tube, cutting a hole in the oiled silk through which it may pass.

Sometimes you can leave on the dressings a week, ten day and even two weeks at a time, and often when you think it necessary to renew them, you are agreeably surprised to find

the wound healed. I have already told you how you can know when the wound needs redressing.

In making your after-dressings you should have everything ready, protective oiled silk, gauze, another piece of Mackintosh cloth, bandages, and the carbolic solution (1 to 40). The spray apparatus should be in perfect order, and so held as to throw the spray into every little pouch and crevice of the wound; in fact, so that it shall reach *every* part of it. The dressing should be gradually removed until you come to the last layer. If everything looks well, simply put on fresh layers of gauze and a piece of Mackintosh cloth. If, however, there is pain and elevation of temperature, it is necessary to remove all the dressings under the spray, examine the parts closely, and put on fresh dressings throughout. The same piece of Mackintosh can be used again after being sponged off with a 1 to 20 solution and dried with a towel.

You will find a tendency for the drainage tube to slip into the wound. How to prevent this I told you in my last lecture. The drainage tube should be allowed to remain in until the second or third dressing, if there is any watery discharge. If not, take it out. If there is a discharge, it is well to wash the wound thoroughly with carbolic solution and replace the tube. Mr. Lister has said, however, that unless there be some evidence of putrefaction going on in the cavity, there is no need of washing it out. How can we determine that such changes are taking place? The piece of oiled silk lying next the wound is the "tell-tale," the "danger signal," for if decomposition has taken place, and sulphuretted hydrogen or any bad gases are there generated, this oiled silk becomes discolored, and tells us plainly that the antiseptic method has failed. This being the case, you must at once inject the wound with the strong carbolic solution, thus trying to get it back to its original condition and renew the dressing.

If, during an operation or dressing, the spray gives out, it is best to have a piece of gauze on hand which you dip in the carbolic solution, and immediately throw over the wound, until your apparatus is in working order again, or another has been procured. Thus you protect the parts from the atmospheric germs.

A word now about wounds that have existed for some length of time. Suppose we have an old ulcer of the leg to deal with. Mr. Lister does not consider the carbolic acid dressing alone sufficient in these cases. He uses a solution of the chloride of zinc, one to twelve, which he paints over the ulcer with a brush. The pain is very intense, but does not last long. After the wound is thoroughly cauterized in this way, Mr. Lister applies his usual dressing for wounds, under the spray. The application of the chloride of zinc was first recommended by Mr. Campbell de Morgan. Its value consists in the fact of its producing an antiseptic effect which lasts for several days.

In operating for necrosis or caries, you should thoroughly cauterize the sinuses, by injecting the zinc solution into them. You may then proceed to dress the wound in the usual antiseptic manner. I cannot urge upon you too strongly the necessity for carrying out fully all these little details.

Now, gentlemen, before concluding this lecture, I would mention that there are other substances which act as antiseptics. Boracic acid and salicylic acid are both used; and as I have stated in my previous lecture, thymol has also been tried, but all have been found inferior to carbolic acid.

In dressing small wounds, such as occur in the every-day practice of physicians, I have found great value in a modified antiseptic dressing. I speak from considerable experience. During the past four years I have had charge of the accidents occurring at the large carpet factory of E. S. Higgins & Co., in this city. About one hundred and fifty lacerated and contused wounds of the fingers have been under my care during that

time. The dressing has been as follows : Replacing the torn and bruised tissue, the wounds are well washed in a 1 to 20 carbolic solution and then wrapped in borated cotton, and covered with an antiseptic gauze bandage. The patients have then been ordered to keep the dressings constantly wet with Squibb's Solution of Impure Carbolic Acid (2 per cent.) This is sold in quart bottles, at the low price of twenty-five cents. The result has been truly remarkable. In no case that I can now remember have I had the slightest trouble from inflammation and suppuration. I have not ordered a poultice to any of these wounds in a long long time. They are kept enveloped in the dressing until there is some indication to change it. Sometimes the dressings have remained on a week or ten days without change. I have found great difficulty in following out this part of the treatment, owing to the class of patients among whom these accidents occur ; they deeming a frequent examination and change of dressings absolutely necessary to a proper recovery. In many of these cases the phalangeal bones were crushed, and the finger joints torn open, and yet, in but two cases that I can now remember, have the patients been compelled to submit to an amputation of a finger. I do not hesitate, no matter how severe the crush has been, if the parts will only hold together, to apply this form of dressing at once, and thus give these poor creatures the chance of saving their fingers and hands.

Before the application of the antiseptic method in the treatment of such injuries, severe inflammation and suppuration would frequently follow and extend in many cases up the forearm, requiring counter openings to be made, and frequently resulting in permanent impairment of the hand and fingers. In the old New York Hospital, I have seen more than one patient with crushed fingers die from pyæmia. I have seen erysipelas frequently follow. Amputation would often be resorted to, so as to convert a torn and lacerated wound or a

compound fracture of the bones, into a clean incised wound, so that it would heal more rapidly and with less danger of inflammation. Now pyæmia and erysipelas are rare even in our crowded hospitals, and I do not hesitate a moment to give the most severe wounds a chance to heal without amputation under the antiseptic treatment.

The borated cotton or lint is made by dipping the lint or cotton in a boiling solution of Boracic acid in water, and then allowing it to dry. You can buy this cotton thus prepared, in the stores. It is a valuable material for dressing, and in cases where the antiseptic gauze does not fit snugly to the skin, the entrance of germs can be prevented by pushing a layer of the borated cotton under the edges of the dressing, and confining it by a gauze bandage.

~~ju-~~ ~~We'll~~ There is another material which I show you, called carbolized tow, and has the property of absorbing discharges very readily. This has been recently introduced by Dr. Robert F. in the New York and Roosevelt Hospitals in place of the ~~gauze~~, it having the advantage of being cheaper. It looks like tow, and has the property of absorbing discharges very readily. The wound is dressed with protective oiled silk, and then the jute is packed thickly over the part and covered with a piece of Mackintosh and a gauze bandage. It is prepared after a formula by Dr. Münnich, in the following manner: A mixture is made of

Carbolic acid crys.	50.0	grams	. . . . .	5 iss.
Resin	200.0	"	. . . . .	viss.
Glycerine	250.0	"	. . . . .	viiiij
Alcohol	550.0	"	. . . . .	3 xvij

The resin is mixed with the greater part of the alcohol and dissolved by the aid of heat, after cooling the carbolic acid is added, having been previously mixed with the rest of the alcohol, after a few minutes add the glycerine. The jute is thoroughly saturated with this mixture and dried. The addition of 50 grms ( $\frac{5}{3}$  iss.) of stearin will make the jute more

flossy, but it takes longer to dry. The jute can be purchased at the Dolphin Manufacturing Co., 60 Duane Street, N.Y., at 8 cents a pound, and when prepared it costs Roosevelt Hospital about 60 cents a pound.

Now, gentlemen, I will conclude by urging you once more to give attention to all these details, even the most minute, in using this method of dressing. By doing so you will obtain results unknown to those who ignore this method, and you will not only prevent severe suffering, but you will save lives. It seems to me with the evidence we now have as to the great value of this method, that a surgeon is neglecting his duty if he hesitates to give it at least a fair trial.

*EDITOR'S NOTE.*

*The Editor reluctantly announces that with this number the "American Series of Clinical Lectures" is brought to a close. It is not necessary here to enumerate the causes that have led to the termination of an enterprize which might very properly have been prolonged for two or three years; but it is believed that the Series as it stands, in three volumes, will not be without a certain value as representing American teaching in the several departments of practical medicine.*

*The Editor would express his grateful appreciation of the support given him by the various contributors, and by the subscribers to the Series. He would also thank the various medical journals, European and American, which have so kindly and fully noticed the Clinical Lectures.*

*New York, Nov. 13th, 1878.*



## THE DIAGNOSIS OF PROGRESSIVE LOCOMOTOR ATAxia.

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**GENTLEMEN** :—The diagnosis of sclerosis of the posterior columns of the spinal cord, or, clinically speaking, of progressive locomotor ataxia, is one which ought to be made readily by all practitioners ; and yet the experience of specialists is to the effect that mistakes in this matter are very common. Consequently it may be worth our while to consider the means of correctly diagnostinating this terrible disease, by a short and clear study of its capital symptoms, and their grouping.

It has seemed to me that the causes of mistaken diagnosis are two-fold :

First—Medical men generally do not fully appreciate the value of the symptom fulgurating pains, as indicative of disease in the posterior columns of the spinal cord. This want of clear understanding leads to calling the first stage of locomotor ataxia by such names as “rheumatism,” “neuralgia,” etc.

Second—Practitioners have in some manner acquired an exaggerated notion of the value of another symptom, viz., staggering or falling when the patient's eyes are closed. This second error conduces to calling a variety of morbid states by the name of an incurable disease. Even the symptom ataxia, I hope to show, is not to be accepted as pathognomonic of the disease in question.

Having these views of the reasons why one of the most definite of spinal diseases is so often ignored, or wrongly attributed to the patient, you may understand why I seem to make my clinics the means of studying semeiology in detail and critically. It has seemed to me, for several years, that among the many desiderata in the medical curriculum none is more important and urgent than that students and practitioners should devote themselves more to analytical semeiology. This exhaustive study of symptoms is to practical medicine very much as general histology is to the great sciences of anatomy and physiology. It is a matter of constant surprise how seldom symptoms (especially nervous symptoms) are determined with scientific accuracy by physicians; and yet the symptoms of disease are the data from which we reason inductively to a diagnosis. If all the symptoms be carelessly observed, how insecure must the conclusion be. And if one symptom is erroneously determined or interpreted, the whole fabric of diagnosis, in many cases, falls to the ground like a house of cards. As an incentive to further analytical study of the symptoms of disease, I may add, without exaggeration, that with our present knowledge the most exact and conscientious examination of a patient sometimes fails to furnish the elements for more than what I am in the habit of calling a diagnosis of probability.

But to return to our subject. I purpose studying it in the following manner: First—Enumerate the symptoms of progressive locomotor ataxia, and classify them into those which are important for diagnosis, and those which are unessential. Second—Group these symptoms into the recognized stages of the disease, and illustrate by cases the diagnosis in each stage. Third—Consider the differential diagnosis between locomotor ataxia and a few conditions which resemble it, and which are sometimes taken for it.

I. The symptoms of progressive locomotor are the following :

(a) Symptoms of real utility in diagnosis :

- Fulgorating pains.
- Hyperæsthesia.
- Anæsthesia.
- Ataxia.
- Paralysis of ocular muscles.
- Absence of tendon-reflex.

(b) Other symptoms, not essential to diagnosis :

- Atrophy of the optic nerves
- Pupillary changes.
- Disorders of various cranial nerves.
- Numbness in lower and upper extremities.
- Peculiar sensations under feet.
- Staggering or falling when eyes are closed.
- Sense of constriction about limbs or trunk.
- Paresis of bladder and rectum.
- Increase and decrease of sexual excitability.
- Rectal, vesical, gastric and laryngeal "crises."
- Arthropathies.
- Dementia.
- Muscular atrophy.

The diagnostic symptoms are worthy of a full description, since their clear appreciation is so important :

1. By fulgorating pains we mean abnormal sensations having the following characters : They are painful sensations, varying in degree from the feeling produced by the prick of a needle to the most excruciating agony. Patients describe quite a variety of these fulgorating pains ; some are like needle-pricks, others like knife-cuts, perpendicularly or longitudinally inflicted ; others resemble the crushing of muscles and bones, yet others are as if a given piece of nerve were pulled or rubbed, and some are like the working up and down of a bolt or a wire in a given space in the limb. However varied in character, these pains are always *sudden, localized, repeated and vagrant*. They are so *sudden* in their appearance that a strong man is surprised into a loud exclamation of pain by their appearance, while feeling otherwise well ; hence the term fulgu-

rating pain. They are *localized* in several senses. First, they make their appearance always (?) in the lower extremities, at any rate in those parts which are later to become ataxic. Second, they are localized in circumscribed regions of tissue, usually the skin. In the vast majority of cases rounded or oval spots in the foot, thigh or leg, are the seat of fulgurating pains. In other instances a circumscribed mass of deeper tissue (muscle or bone, or joint apparently) is the seat of tearing or crushing pain. These pains are *repeated*; that is to say one patch of skin, or mass of deeper tissue, is the seat of a succession of stabbing or crushing pains, occurring every few moments for minutes, hours or days. For example, a spot the size of a silver dollar upon the instep or calf may be the theatre of an agonizing paroxysm of pain; innumerable acute darts of pain appearing in the region for one night or twenty-four hours. Lastly, fulgurating pains are *vagrant*. No one nerve trunk is their habitual seat, but any portion of the extremities may be visited by them. Patients usually give up in despair the attempt to show you every spot in which they have suffered; and they generally indicate as foci of pain the heel, instep, and thigh. If we consider the pathological anatomy of the disease, we easily understand why almost every sensory nerve of the effected extremities should at various times react to the irritation to which its rootlets are subjected in the posterior radicular columns.

You perceive that by the above characters you may distinguish fulgurating pains from a variety of others. For example, sciatica, or any neuralgia of the extremities, is characterized by the recurrence of pain along the nerve trunk, or along some of its branches—the patient can usually mark out with his forefinger the distribution of the affected nerve. In rheumatism the pain is usually dull, deep-seated, affecting muscles or articulations; it often involves numerous muscles or joints at one time, and is made worse by exertion. As

regards the influence of weather, both fulgurating and rheumatic pains are apt to occur or increase in severity just before storms or sudden depressions of the barometer. The pain caused by vertebral caries, or by spinal tumors, is localized, and often can be referred to a spinal nerve trunk and its distribution. In poliomyelitis anterior, and in muscular atrophy there may occur severe pains, but they more resemble neuralgic pains as above described.

2. The hyperæsthesia observed in locomotor ataxia is not peculiar in kind, but in distribution. It consists in ordinary over-sensitiveness of the skin, tenderness if you please, limited to the patches of skin which are the seat of fulgurating pains. For example, if an oval spot about two inches in diameter on the anterior region of the thigh be the seat of stabbing pains for a few hours, it becomes exquisitely tender, and remains so for some time after the termination of the paroxysm. In ordinary neuralgia the hyperæsthesia is very different; we find a number of tender "points," not patches, some at the places where the nerve trunk becomes accessible to pressure, others where its branches approach a cutaneous distribution; there are nearly always two or more points in a neuralgic district.

3. Anæsthesia occurs in two ways in locomotor ataxia. At an early period it is claimed that careful observation will discover limited, and usually laterally symmetrical patches of skin which are partially or wholly devoid of sensibility. Possibly these patches represent regions where fulgurating pains have been repeatedly experienced. Later in the disease a progressive impairment of sensibility is developed in the feet and ascends; it may ultimately become complete throughout the lower (and upper) extremities. The chief peculiarities of this anæsthesia are the predominance of analgesia or failure to perceive painful impressions, and retardation in the transmission of what impressions are perceived. This retardation I

have often found, and have known an interval of more than one minute to occur between the moment of pricking a patient's foot, and that of his saying that he felt it. Intervals of ten or twenty seconds are frequently found. I intend saying more of this anaesthesia when I come to speak of differential diagnosis.

4. Ataxia of movement, a variety of incoordination, is justly held to be a most valuable symptom of progressive locomotor ataxia. Yet it is by no means pathognomonic as the disease (or lesion) may exist and the patient be incurable without a trace of ataxia being present; and conversely, ataxia may be exhibited by patients who have not systematic sclerosis of the posterior columns. An exact delineation of ataxia seems to me as important to attempt as that of fulgurating pains. By ataxia I understand a disorder in voluntary movement caused by want of harmony in the action of antagonistic muscles. The result is, that in doing a willed act, as walking, or putting the index finger on a given spot, there occur certain oscillations of the member used, which oscillations are the result of inharmonious automatic action of various muscular groups, extensors, flexors, abductors, and adductors. In the lower extremities the extensor and abductor muscles usually predominate, hence the jerky, stamping walk of tabetic patients. Several peculiarities are worth noting. Ataxic movements are not observed while at rest; they become evident when volitional acts are attempted. In chorea we have a form of incoordination in which various muscular groups contract involuntarily and at irregular times, but as much when the patient tries to keep still as at any time. Besides, in chorea, it cannot be said that antagonistic groups of muscles are affected, as the muscular contractions attack any and all muscles in the most capricious manner. Again, ataxic movements are not rhythmic, which serves to distinguish them from the movements observed in paralysis agitans.

The presence of ataxia may be determined by the following methods of examination: When the patient is sitting or lying quietly no disorder is visible. On bidding him try to walk, if still able to stand, he starts off with his feet thrown outward and forward in a very exaggerated manner, and the heel is brought down forcibly. At the same time he staggers or oscillates like a drunken man, but this is not from ataxia. If the patient be made to stand alone, upon being supported by a person on either side he will make the same punchinello-like movements of the legs in lieu of regular walking movements. In both degrees of disability the extent of irregular movements is much increased if the patient's eyes be closed. If the patient be placed upon a couch, and told to extend and abduct one of his legs so as to bring his great toe against the observer's forefinger large oscillations will occur, and the attempt may wholly fail. Again in trying to do this, or in simply trying to raise the leg such enormous extensor and abductor action may take place as to cause the limb to strike persons standing by the bed. While recumbent, if the patient's eyes be closed and he be told to place the heel of one foot upon the patella of the opposite leg, he will do it only after great aberrations, or wholly fail.

If we suspect ataxia in the upper extremities we bid the patient place the end of his forefinger upon a small object, such as our own forefinger, or the end of his nose. If there be marked ataxia the object will only be reached after a number of misses or oscillations of the whole forearm and hand. If he try to touch his own nose he may only succeed after having poked his finger into his mouth or eyes, or upon the cheek. Upon attempting the same action with eyes closed the difficulty is greatly increased, and may actually be insuperable. All actions requiring coordination, as eating, writing, dressing, etc., become difficult or impossible. In all this disorder we observe no tremor or choreic jerks.

Mere muscular strength is nearly or quite preserved in arms and legs.

Paralysis of various ocular muscles requires no description. Let it suffice to say that the third nerve is the one usually affected, though the abducens and patheticus are also paralyzed in some patients. The importance of the symptom lies in its frequency, and its accompanying or even preceding the fulgurating pains of the first stage of the disease. So true is this that a good many patients first consult an oculist for some trouble about the eye, and are by him referred to neurologists.

II. Let us now pass on to the diagnosis of progressive locomotor ataxia in its three generally recognized stages :

(a) The first stage of the disease may well be designated, the *stage of fulgurating pains*. In order of frequency and importance these are the symptoms which characterize it :

- Fulgurating pains.
- Localized hypæsthesia.
- Diplopia from strabismus.
- Ptosis from palsy of third nerve.
- Small pupils.
- Unequal pupils.
- Numbness and slight anæsthesia of feet.
- Sexual excitement.
- Seminal emissions.
- Paresis of the bladder.
- Diminished tendon-reflex (tested at the knee).
- Impaired sight from atrophy of optic nerves.
- Slight arthropathies.
- Localized anæsthesia.
- Absence of paralysis or ataxia in the limbs.
- General health excellent.

Of this long list only the fulgurating pains and ocular paralyses are of great importance, the former only are absolutely indispensable to the diagnosis. In some cases, for months and even years, no symptoms are present except fulgurating pains, and I think that from them alone, if we deal with an ordinarily intelligent patient, the diagnosis ought to be made. How many men

have come to me with the story that during years of pain preceding any disorder in movement, their family physician had told them, "O, its nothing but rheumatism."

Very small pupils with even rare fulgurating pains make up quite a clear symptom-group ; and if to these we have added in a few months ptosis or internal strabismus, the case is very positively one of sclerosis of the posterior columns. Once in a great while we meet with the early combination of atrophy of the optic nerves and fulgurating pains. I have seen examples of this unusual early stage.

The following histories illustrate the first or neuralgic stage of sclerosis of the posterior column.

CASE I. Prolonged first stage. Male, aged 57 years ; an artist. Comes for advice about a "neuralgia" of long standing. For twenty-seven years has had severe pains in his lower extremities, and since two or three years also in the upper. Patient describes these pains as sudden, sharp, teasing, sometimes of atrocious severity, occurring in spots or patches of round or oblong shape. These pains recur in one spot for some time, varying from a few minutes to hours and days. In the course of these many years has had foci of pain in nearly every part of the lower extremities, more especially near the knees and ankles. In the last few years the intervals between paroxysms have become shorter, and the pains have grown more severe. There is now mydriasis of the right eye, a condition which has existed thirty years, without diplopia. A mere trace of numbness has made its appearance in the legs, detected only at times by rubbing the skin. Painful spots are hyperæsthetic during and after paroxysms. In the last few years urine slowly passed. Floor or ground feels normal under feet ; no difficulty in walking. Examination shows dilatation of right pupil ; no diplopia, or changes in the optic nerves ; no ataxia of upper or lower extremities ; very slight staggering when patient at-

tempts to stand with eyes closed. The soles of the feet show a trace of anaesthesia to anaesthesiaometer. Reflex from ligamentum patellæ lost; no paresis. I am disposed to believe that this is the longest first stage of posterior spinal sclerosis on record.

CASE II. Prolonged first stage: arthropathies. Male, aged 32 years. Sent to my clinic by Dr. C. Williams. Characteristic pains in lower extremities for twelve years; spots of pain hyperesthetic at time of attack. Slight numbness of feet; swelling of both knees in last two years; no difficulty in locomotion. Examination shows moderate anaesthesia and analgesia in feet and legs nearly to knees; absence of knee tendon-reflex; double chronic arthritis of knee-joints with crepitations. Careful testing with eyes open or closed reveals no ataxia or staggering.

In the vast majority of cases, as exemplified in the succeeding cases, the duration of the first stage is from one to four years.

(b.) The beginning of the second stage is characterised by the appearance of ataxic movements amid a large number of other symptoms. This may be called the *ataxic stage*. The chief symptoms are, in order of importance:

- Ataxic movements.
- Fulgorating pains.
- Localized hyperesthesia.
- Ocular paralyses.
- Numbness and other dysesthesiae.
- Anesthesia.
- Staggering with closed eyes.
- Failure of sexual power,
- Absence of tendon-reflex.
- Rectal and vesical paresis.
- Gastric crises.
- Laryngeal “
- Vesical “
- Severe arthropathies.
- Amaurosis.
- Complicating common transverse myelitis.
- Spinal congestion.
- Paralytic dementia.
- Vesical catarrh.
- Preservation of mere muscular force.

The exact grouping of the above symptoms at a given period varies infinitely in a series of cases. The all-important symptom is ataxia. Yet ataxia without some of the above accompaniments, notably without fulgurating pains, does not indicate systematic sclerosis of the posterior columns of the spinal cord, though it may mean that there is *some* disease of these columns, as, e. g., in disseminated nodular sclerosis, in diphtheritic ataxia, etc. As regards the distribution of the ataxia, it is paraplegic in the vast majority of cases for all time, or for a long period. The upper extremities may be affected very severely while the patient is able to stand and take a few steps with the help of a cane, whereas in other cases the patient may die after having been many years bedridden without any extension above the waist taking place.

The following are abbreviated histories of patients first seen in the second or ataxic stage of posterior spinal sclerosis. They illustrate the varied grouping of symptoms.

CASE III. First stage passing into the second. Male, aged 35 years. During the autumn of 1877, and since, has had moderately severe fulgurating pains in thighs, legs, and feet. These are short, sharp, darting pains recurring in one spot for minutes or hours ; the last paroxysm was upon the left instep and lasted twenty-four hours. During the spring and summer has thought that his eyes were growing weaker. Numbness has appeared in the sole of both feet only in the last two weeks. Once or twice urine has escaped involuntarily. No diplopia, or impairment of vision. Patient standing with closed eyes oscillates a little ; his walk is a little stamping but not clearly ataxic. On the soles of the feet the asthæsiometer shows slight anaesthesia ; pricking and touching are well felt. No reflex action from sole or ligamentum patellæ. Strength at knee-joints, and grasp normal. Is generally weak and anaemic.

In this case the first stage is about to pass into the second, or ataxic stage, after having lasted only about a year.

CASE IV. Developed second stage with ocular paresis. Male, aged forty-four years. Was well until the summer of 1876, when there occurred dizziness and a tendency to go one-sided in walking. In the course of the next few months legs became weak but not numb, and in the summer of 1877, eyes became affected. Patient denies having had pains, but says that he has had "rheumatism," and proceeds to describe regular fulgurating pains in various spots in the lower extremities; shooting pains in one spot for hours or days. These spots were hyperæsthetic. Has had such pains for four years. When he consulted an oculist in summer of 1877, had diplopia, which has continued. For months has staggered when closing eyes (or when washing face); and feet have also been numb. It seems to the patient as if he were walking on cotton or india-rubber. No vesical symptoms; no symptoms in hands. Examination shows slight diplopia when looking outward to the right (paresis of right abducens), upper extremities strong and well coordinated. The walk is highly characteristic; the feet are kept apart, body swaying, legs jerked forward and outward, and heel brought sharply down at each step. Closing eyes makes standing impossible; looking up at ceiling aggravates walk. Soles of feet are much anæsthetic; sensations blunted and retarded. Reflex from soles abnormally great; no tendon-reflex at knees.

CASE V. Fully developed second stage; ocular symptoms, gastric crises. A female, aged fifty-two years, observed in the Presbyterian Hospital, January, 1873. Admitted to the hospital on November 16th, 1872; gave the following history: eighteen months previously had a first attack of severe vomiting, recurring every two or three hours, and extending over a period to thirty-six hours. Similar seizures recurred almost punctually every three months until last March. About ten months ago,

after the third attack, she experienced sharp, shooting pains in her lower extremities from the hips down, continuing more or less actively for about three weeks. Although patient was weak yet she could walk well enough at that time, but not long afterward legs became feeble. Last spring and since the vomiting recurred more frequently, less violently, and irregularly. Two months ago, (September 1872) she noticed that the lid of the left eye could not be fully raised. Just previous to this she had experienced shooting pains in the upper extremities ; pains just like those which had occurred in the lower extremities. The pains in the arms lasted about two weeks. From time of admission to January 1st, 1873, patient was treated by Dr. Wynkoop for nausea and frequent vomiting. On taking the service I examined Miss L., and determined the presence of the following symptoms. There is ptosis on the left side, the pupil is a little dilated, and there is some external strabismus. Does not converge well with right eye. Slight anæsthesia of the second and third branches of the trigeminus, (side not stated). Grasp of hand good ; with eyes closed patient has difficulty in placing forefinger on end of nose, i.e., there is ataxia of the upper extremities ; more on the left side. Slight tactile anæsthesia of fingers and hands. Lower extremities are not strictly speaking paretic. In recumbent posture slight incoordination of legs. Later the vomiting was controlled ; hysterical symptoms of various kinds set in (so marked as to lead some of the medical staff to doubt the correctness of my diagnosis\*), and, finally, on April 14th, the patient died rapidly of cerebellar haemorrhage. A post-mortem examination, supplemented by microscopic study of specimens, showed that the posterior columns of the spinal cord were extensively sclerosed.

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\* See a paper entitled Hysterical Symptoms in Organic Nervous Affections, by E. C. Seguin, M.D. *Archives of Electrology and Neurology*, N. Y., May, 1875.

(c) The third stage may be said to begin when the anaesthesia and ataxia are so great, as to render the patient perfectly unable to stand, or to "use his legs" as he terms it. This might aptly be called the *pseudo-paralytic stage*.

In this terminal period we may have any of the following symptoms in various groupings, or even all of them :

- Fulgorating pains.
- Ataxic movements.
- Absolute anaesthesia.
- Loss of sexual power.
- Rectal and vesical paresis.
- Paralysis of ocular muscles.
- Amaurosis.
- Deafness.
- Various "crises,"
- Severe orthropathies.
- Disorganization of large joints without pain,
- Seeming paralysis of the extremities from anaesthesia,  
(and loss of muscular sense?).
- Dementia.

Mere muscular power probably preserved. Electro-muscular contractility is preserved. Reflex movements reduced or abolished.

As complications :

- Cystitis and pyelo-nephritis.
- Pulmonary phthisis.
- Muscular atrophy.
- Transverse myelitis, etc.

What is remarkable and characteristic in such cases is that the helpless patient whose legs fly about in the wildest manner when he attempts a voluntary movement, or, who, because of absolute anaesthesia knows not how to guide his movements, can, for a few moments, show great strength of resistance to flexion at the knee-point, or a nearly normal grasping power in his hands. In some cases, however, the patient is so completely isolated from his extremities by anaesthesia, so ignorant of their existence and whereabouts, that he can not move them. Yet, post-mortem evidence show that the direct motor tract from the

brain to the muscles is intact, and reasoning leads to the conclusion that there is at no time a true paralysis in the uncomplicated disease.

III. Differential diagnosis. This needs be made from a number of conditions. When defining the fulgurating pains, characteristic of the first stage, I pointed out to you how they may be distinguished from purely neuralgic and rheumatic pains. The diseases which are often miscalled locomotor ataxia are the following:

1. Hysterical paraplegia of incomplete degree. The legs in this condition exhibit extreme anaesthesia, and if the patient be told to stand and then close her eyes she will oscillate and fall if not supported. Tested in the recumbent posture or by walking no ataxia can be discovered, and the history of the case does not reveal the previous occurrence of fulgurating pains.

2. Diphtheritic ataxia. In 1864, Prof. Jaccoud, of Paris, called attention to the occurrence of ataxia movements in certain patients who were said to have diphtheritic paralysis. I saw a remarkable case of this sort last winter in an adult who was supposed to have locomotor ataxia. He walked precisely like a tabetic patient, jerking his legs outward and forward, bringing his heel down. But in such a case we can make out an acute development; and if the eyes are affected it is in a very different way from that seen in locomotor ataxia; in diphtheritic cases the ciliary muscle alone is paralyzed, causing loss of accommodation and wide pupils. Negatively we fail to get an account of fulgurating pains, anaesthesia of the feet, peculiar vesical symptoms. My patient recovered in a few weeks.

3. Paralytic dementia. In this disease the walk sometimes becomes almost ataxic, or at any rate a good deal of stamping with the heel is observed. In a few cases also, minor fulgurating pains occur. The distinction is founded upon the different grouping of symptoms and the unimportant nature of the

pains. Dementia (gradual diminution of mental power,) with more or less marked exalted notions, irregularity of the pupils, and tremulous, jerky speech are the prominent symptoms. Still it must be borne in mind that there is a *bona fide* relationship between the two affections, shown in an ascending and a descending manner. In the ascending form true locomotor ataxia terminates with symptoms of paralytic dementia—of this I have seen at least four cases. The descending form has been alluded to at the beginning of this section. In the former case the spinal symptoms are primary and most important ; in the latter the symptoms of dementia command our attention and govern the diagnosis.

4. Disseminated nodular spinal sclerosis. In this rare disease we do observe ataxia ; but it is of a grosser and less symmetrical sort. One extremity alone may be affected. Fulgurating pains are absent, or if they have occurred, it is only in a special region ; there is true paralysis in many parts, and the paralytic ocular symptoms are wanting. Besides, if the disease (as is usual) invade the medulla and brain, there are super-added exceedingly characteristic symptoms, viz : interrupted or syllabic speech, nystagmus, hallucinations and delusions.

In the cerebral form of disseminated nodular sclerosis we have ataxic movements, or ataxic tremor, without marked paralysis, but with cerebral symptoms, and without fulgurating pains, anæsthesia of the soles of the feet, sexual and vesical symptoms.

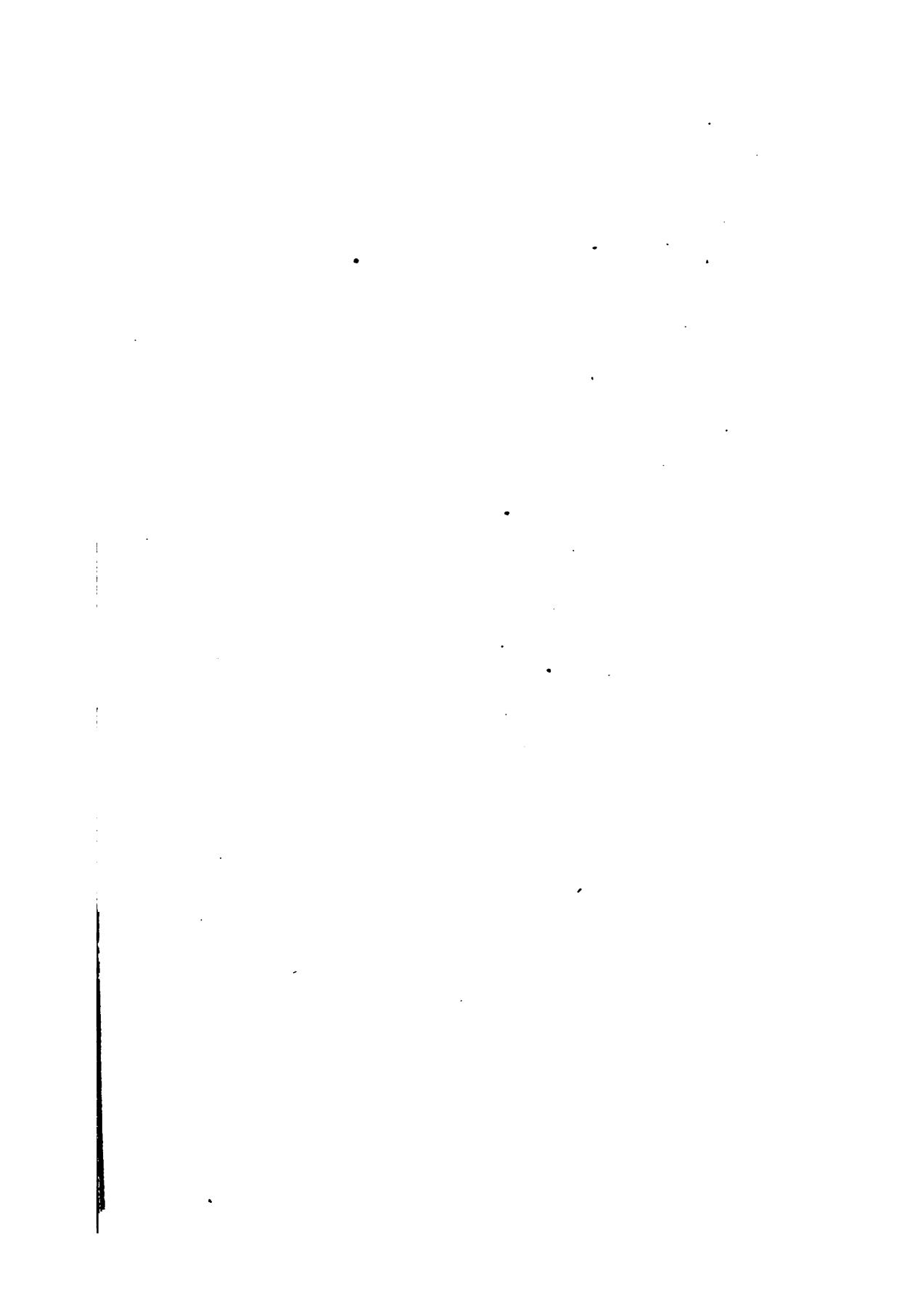
5. Chronic, transverse or diffused myelitis. It must seem strange that this disease should be confounded with locomotor ataxia ; but such is the fact. I have had quite a number of supposed cases of sclerosis of the posterior columns brought to me here and to my office, and the physicians in charge of the cases seemed much astonished at my diagnosis. The mistake turns wholly upon the exaggerated notion which practitioners

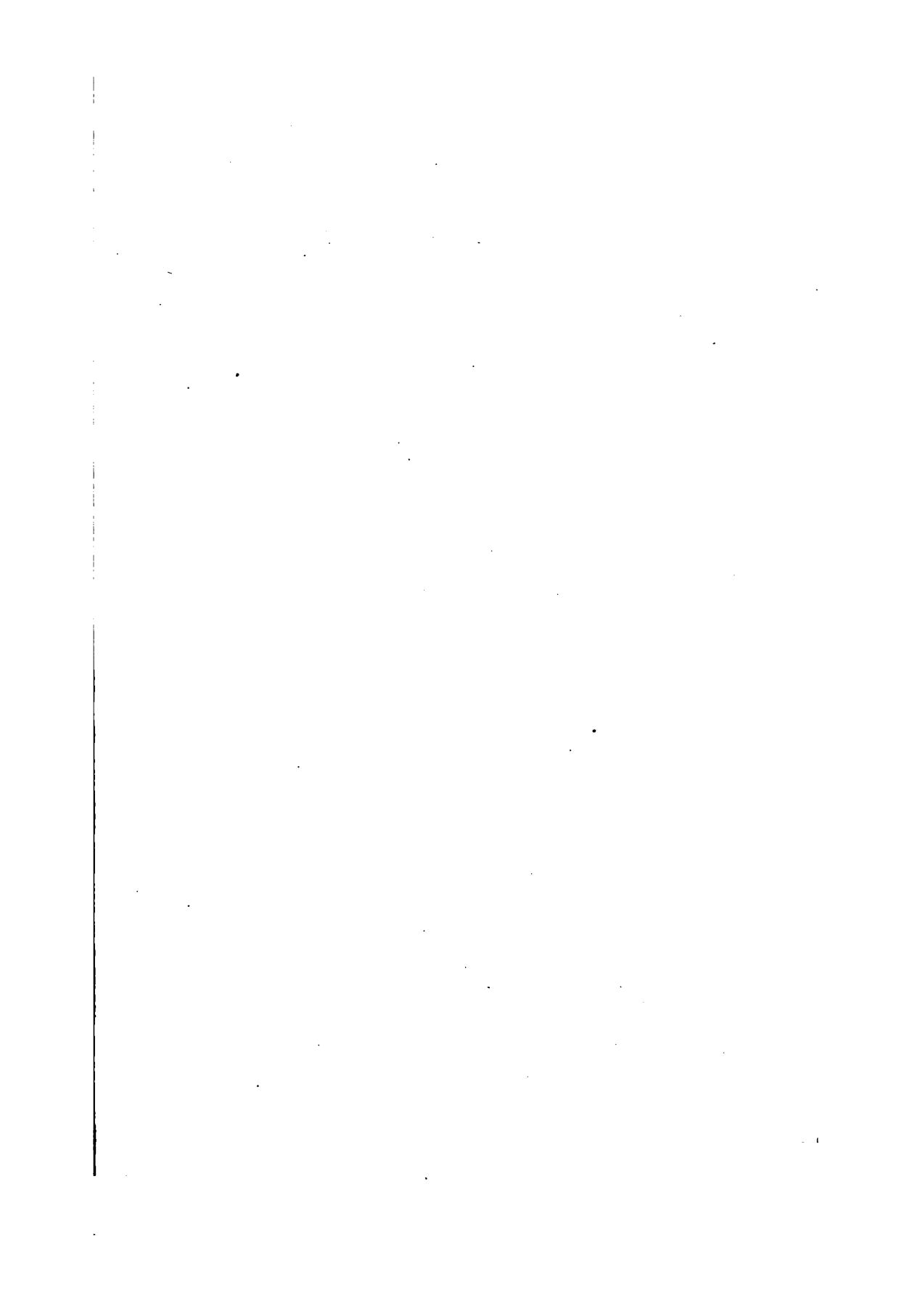
entertain of the value of the symptom staggering with closed eyes. Patients with myelitis have numb and anæsthetic feet and legs, and when they are made to stand with eyes closed they oscillate and fall, just as do patients with hysterical paraplegia.

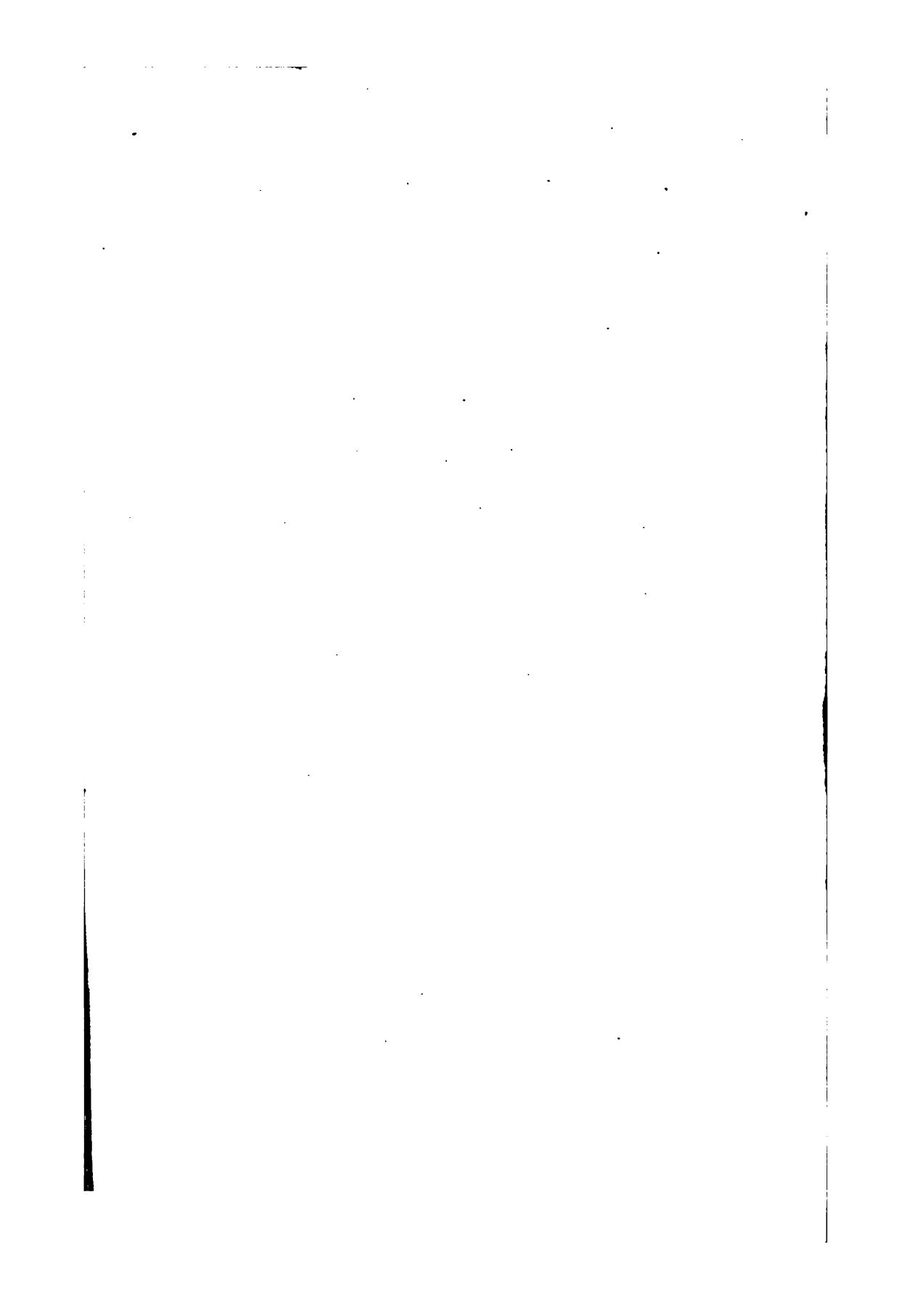
I would now repeat for the hundredth time, that staggering or falling with closed eyes is present in many affections of the nervous system, central and peripheral, and that it is not characteristic of any one disease. It simply indicates, in most cases, that the feet are anæsthetic ; in a few instances it cannot be explained in this way, and may be due to the loss or impairment of that questionable form of sensibility, the muscular sense.

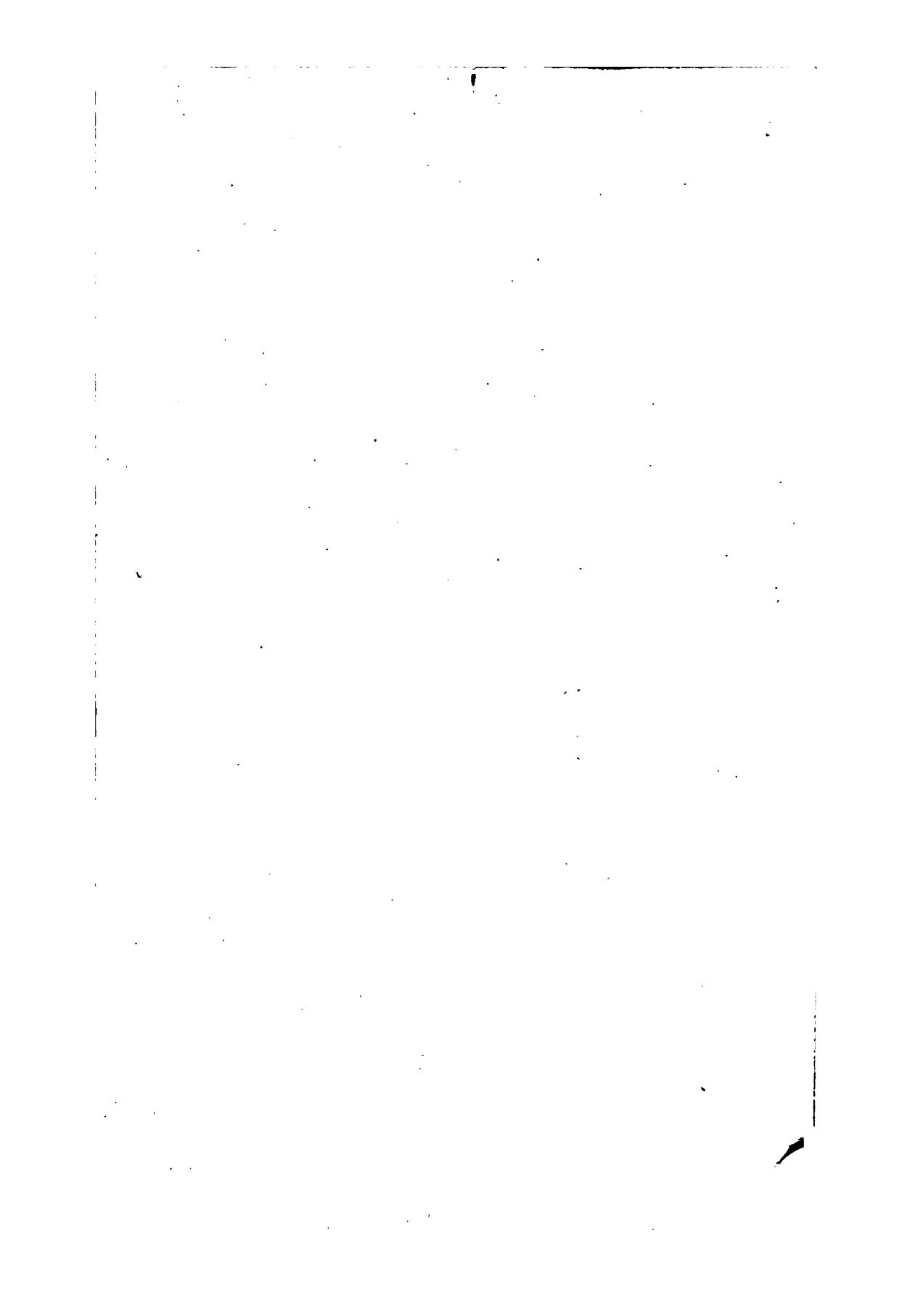
Several years ago, in the early days of this clinic, I brought into the amphitheatre a healthy young man, whose soles had been frozen with ice and salt. He walked fairly well with his eyes open ; but when they were closed, he oscillated a great deal, and was in danger of falling.

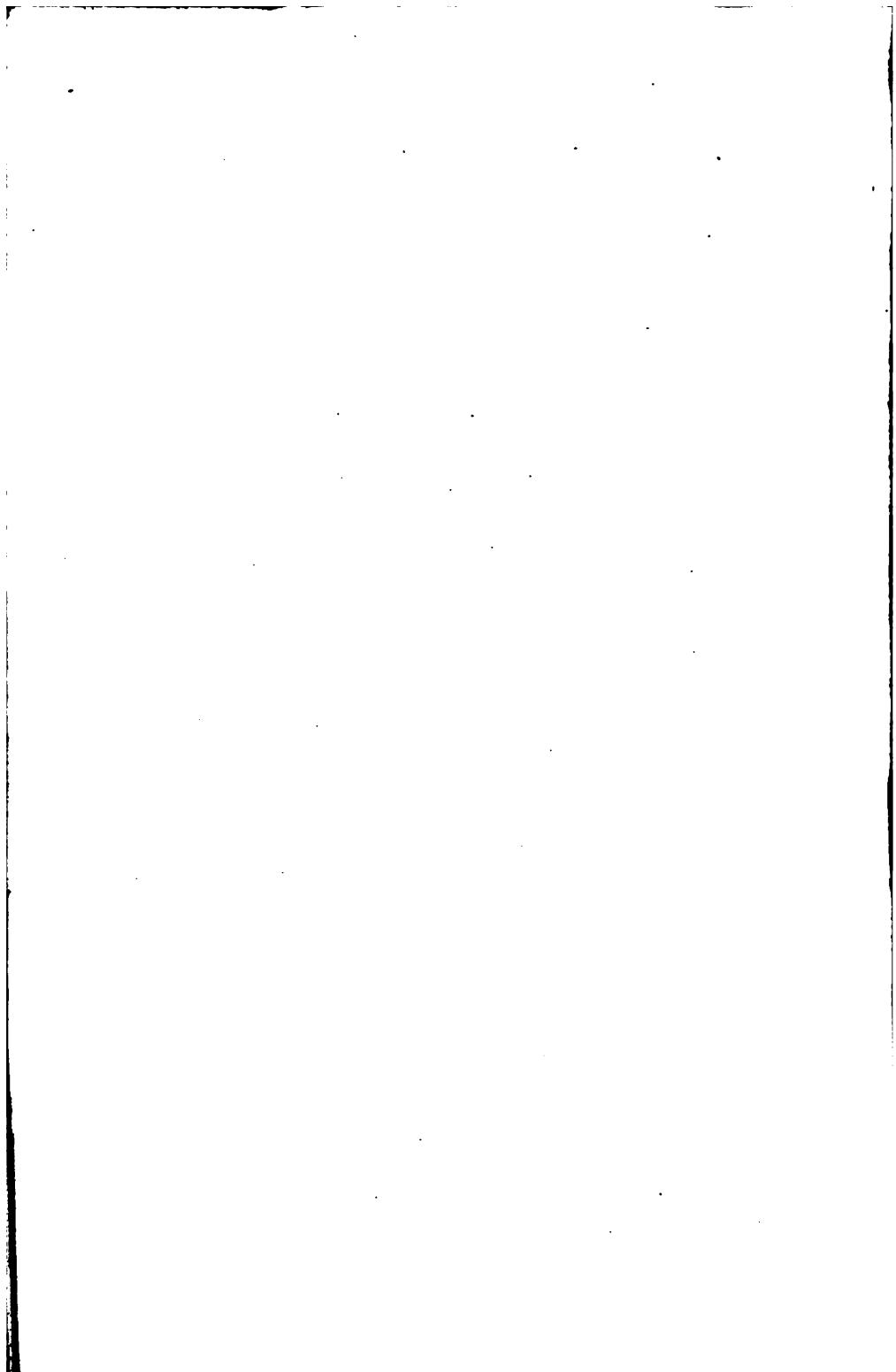
Finally, gentlemen, I would remark that the recorded cases of cure of locomotor ataxia will not stand the test of the methods of diagnosis detailed above ; and their publication has not led me to abandon the opinion, held by all authorities I believe, that sclerosis of the posterior columns is an incurable disease at the present time.

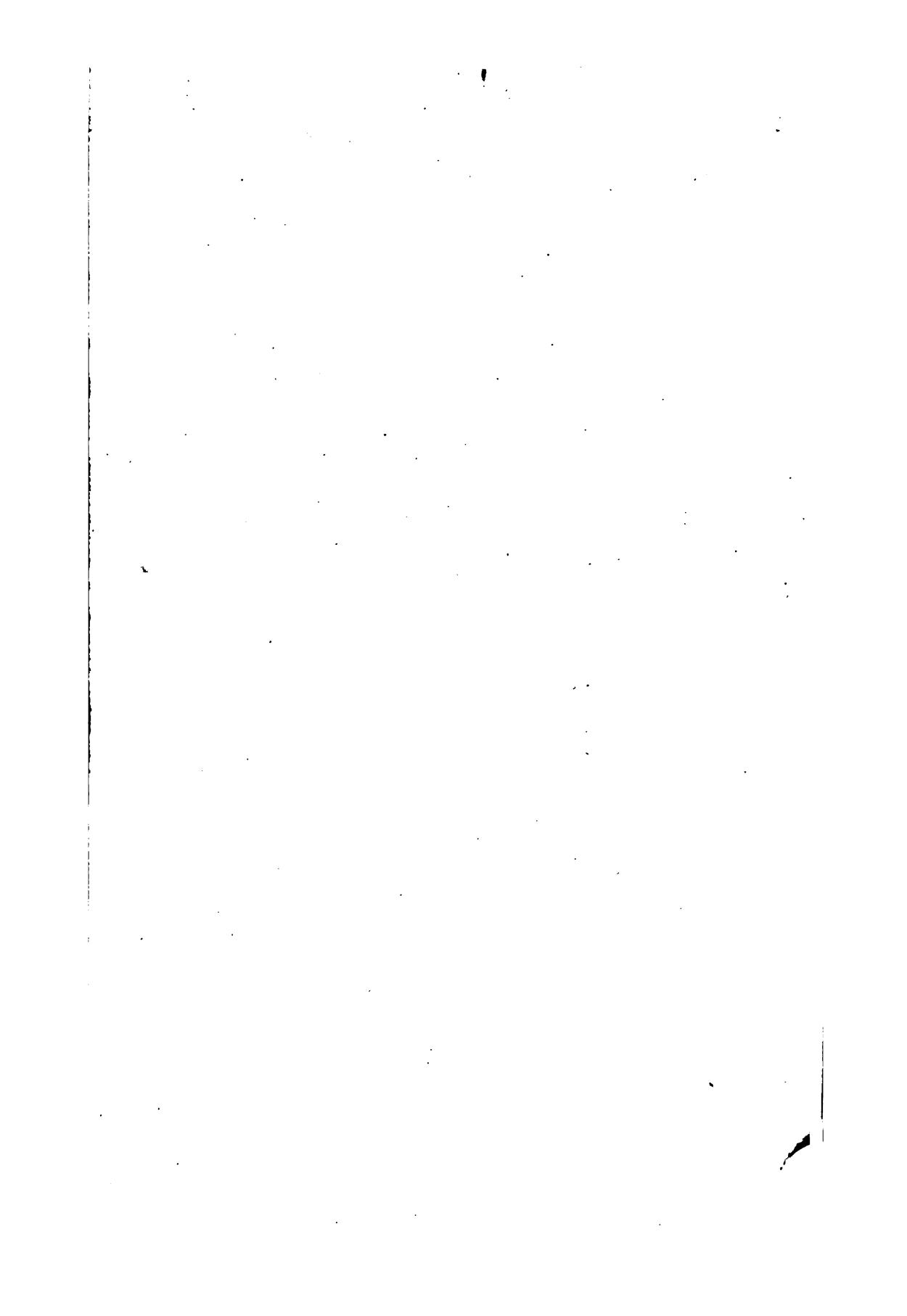












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